



FCC RF Test Report

Product Name:
**LTE/HSPA+/HSUPA/HSDPA/UMTS/GSM/GPRS/EDGE Mobile
Phone with Bluetooth**

Model Number: HW-01E

Report No: SYBH(Z-RF)011082012-2002
FCC ID: QISU9501L

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Notice

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2. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
3. The laboratory has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 6369A-2.
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8. Normally, the test report is only responsible for the samples that have undergone the test.
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1 General Information

1.1 Applied Standard	
Applied Rules:	47 CFR FCC Part 2:2011, Subpart J 47 CFR FCC Part 24:2011, Subpart E ANSI/TIA 603C:2004
1.2 Test Location	
Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
1.3 Test Environmental Condition	
Ambient Temperature:	20 – 25 °C
Ambient Relative Humidity:	45 – 55 %
Atmospheric Pressure:	101 kPa

2 Summary

Table 1 Summary of results

Test Case	FCC Part No.	Requirements	Result
PCS Band			
Transmitter Output Power	2.1046 & 24.232	Peak EIRP not exceed 2 W Peak-to-average ratio not exceed 13 dB	Pass
Modulation Characteristics	2.104	Digital modulation	Pass
Occupied Bandwidth	2.104	(Not specified)	Pass
Band Edges Compliance	2.1051 & 24.238	Below -13 dBm/1%*EBW, in 1 MHz range	Pass
Spurious Emission at Antenna Terminals	2.1051 & 24.238	Below -13 dBm/1 kHz, 9 kHz to 150 kHz Below -13 dBm/10 kHz, 150 kHz to 30 MHz Below -13 dBm/1 MHz, 30 MHz to 10 th harmonics	Pass
Field Strength of Spurious Radiation	2.1053 & 24.238	Below -13 dBm/1 MHz	Pass
Frequency Stability	2.1055 & 24.235	Stay within the authorized frequency block	Pass

3 Product Description

3.1 Product Information

3.1.1 General Description

HW-01E is subscriber equipment in the LTE/WCDMA/GSM system. The LTE frequency band is Band I. The HSPA+/HSUPA/HSDPA/UMTS frequency band is Band V, Band VI and Band XIX. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only PCS1900MHz test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, LTE/WCDMA/GSM protocol processing, voice, video, MMS service, GPS, AGPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and USIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

3.1.2 Board Information

Table 2 Board Information

LTE/HSPA+/HSUPA/HSDPA/UMTS/GSM/GPRS/EDGE Mobile Phone with Bluetooth		
HW-01E		
Board and Module		
Equipment Designation / Description	Hardware Version	Software Version
MAINBOARD	U9501L_VB	U9501LV100R001C341B126

3.1.3 Battery Technical Data

Name	Manufacture	Description
Rechargeable Li-ion	Huawei Technologies Co., Ltd.	Battery Model: HB4T1HV Rated capacity: 1800mAh Nominal Voltage:  +3.8V Charging Voltage:  +4.35V

4 Test Description

4.1 Supported Frequency Range

Characteristics	Description
Downlink	1930 to 1990 MHz
Uplink	1850 to 1910 MHz

4.2 Transmitter / Receiver Characteristics

Characteristics	Description
System Type	GSM
TX Output Power (per Antenna Port)	GSM system: Power class 1
Channel Spacing(s) / Bandwidth(s)	GSM system: 200 kHz
Designation of Emissions	GSM system: 249KGXW (GMSK modulation), 249KG7W (8PSK modulation)

4.3 Antenna Gain

Antenna Gain(dBi)	0.9
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4.4 Power Supply

Specification	Description
Power Supply Type	Directly Connected to DC /AC Power Supply
Input to EUT (DC power)	DC Voltage Nominal: $\approx$ 3.8 V DC Voltage Range: $\approx$ 3.5 V to 4.35V
Input to EUT (AC power)	AC Voltage Nominal: ~ 120 V (50/60 Hz) AC Voltage Range: ~ 100 V to 240 V

5 General Test Conditions / Configurations

5.1 RF Channels under Test

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
TM1/TM2	TX	Channel 512	Channel 661	Channel 810
		1850.2MHz	1880.0MHz	1909.8MHz
	RX	Channel 512	Channel 661	Channel 810
		1930.2 MHz	1960.0 MHz	1989.8 MHz

5.2 Test Modes

Test Mode	Test Modes Description
TM1	GSM/GPRS, GMSK modulation
TM2	EDGE, 8PSK modulation

5.3 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	3.5V
	VN	3.8V
	VH	4.35V

NOTE: VL= lower extreme test voltage

VN= nominal voltage

VH= upper extreme test voltage

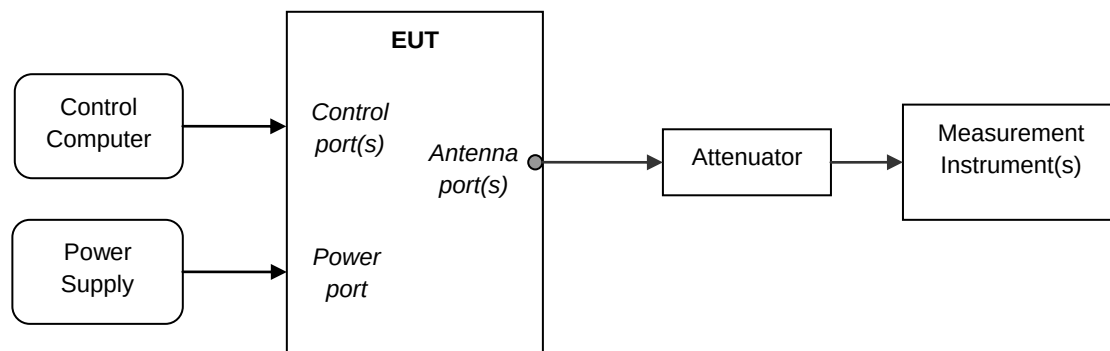
TN= normal temperature

5.4 Test Setup

5.4.1 General Test Setup Configurations

Configuration	Description
Test Antenna Ports	Until otherwise declared, all TX tests are ONLY performed at the main Transmitter antenna port (e.g. TRXA, TXA and so on) of the EUT, and all RX tests are ONLY performed at the main Receiver antenna port (e.g. TRXA, RXA and so on) of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

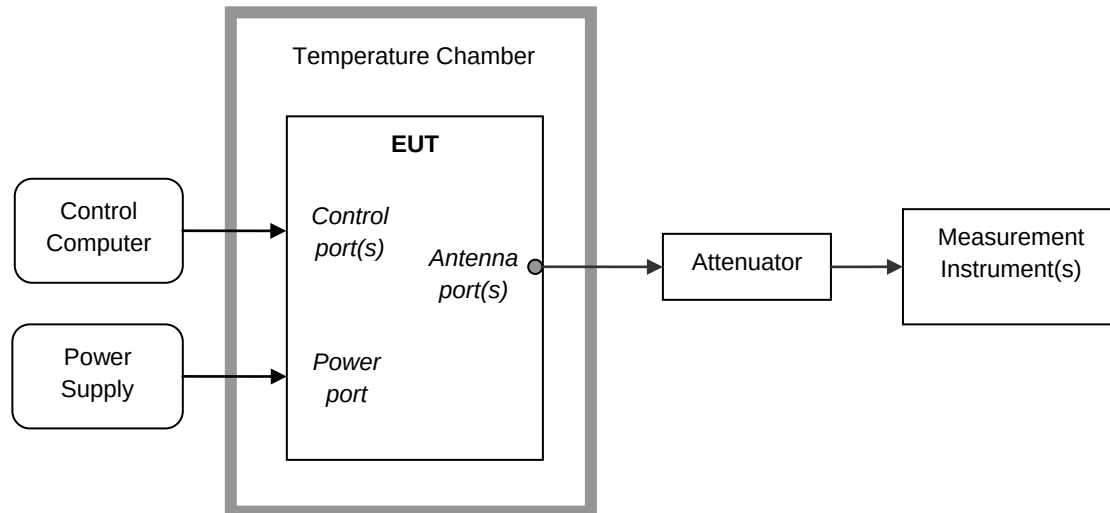
5.4.2 Test Setup 1



NOTE:

A peak to average ratio measurement is performed at the conducted port of the EUT. For WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. The traces are generated with the spectrum analyzer set

5.4.3 Test Setup 2



5.4.4 Test Setup 3

NOTE1: Effective radiated power (ERP) or Effective Isotropic radiated power (EIRP) refers to the EUT radiation power output, assuming all emissions are radiated from half-wave dipole antennas or horn antennas.

NOTE2: The EUT was set on insulator 80cm above the Ground Plane. The setup and test methods were according to ANSI-TIA-603C 2004. The measurements were carried through with a Rohde and Schwarz Test Receiver and control software.

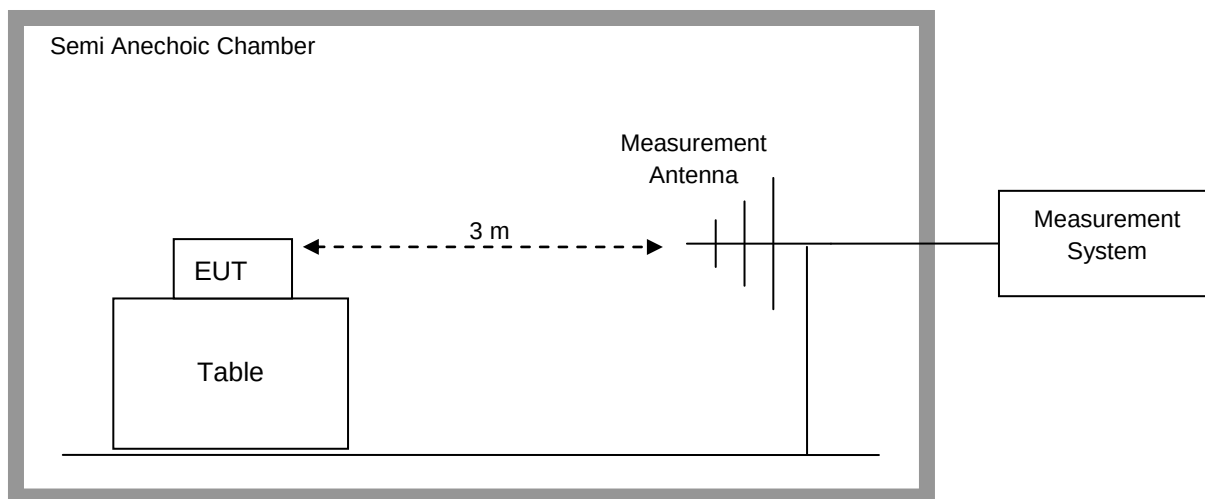
Step 1: Pre-test to find the Maximum ERP or EIRP

1. Connect the test system according to Figure. EUT is running for 30 minutes before test, and measurement instruments are warming-up for 30 minutes.
2. Set up communication link between Universal radio communication tester and EUT, set EUT working frequency, and control EUT to transmit at maximum power.
3. Set the center frequency of the signal analyzer or receiver to the EUT's operating frequency, the RBW is equal to the emission bandwidth of the signal. Set RMS detector for the test, and the span is equal to 2 times of emission bandwidth, the other settings should remain automatic. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0° to 360°. The receiver antenna has two polarizations V and H. A portable or small unlicensed wireless device shall be

placed on a non-metallic test fixture or other non-metallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z) axis positions such that emissions from the EUT are maximized. Measure the EUT maximum RF power and record the result.

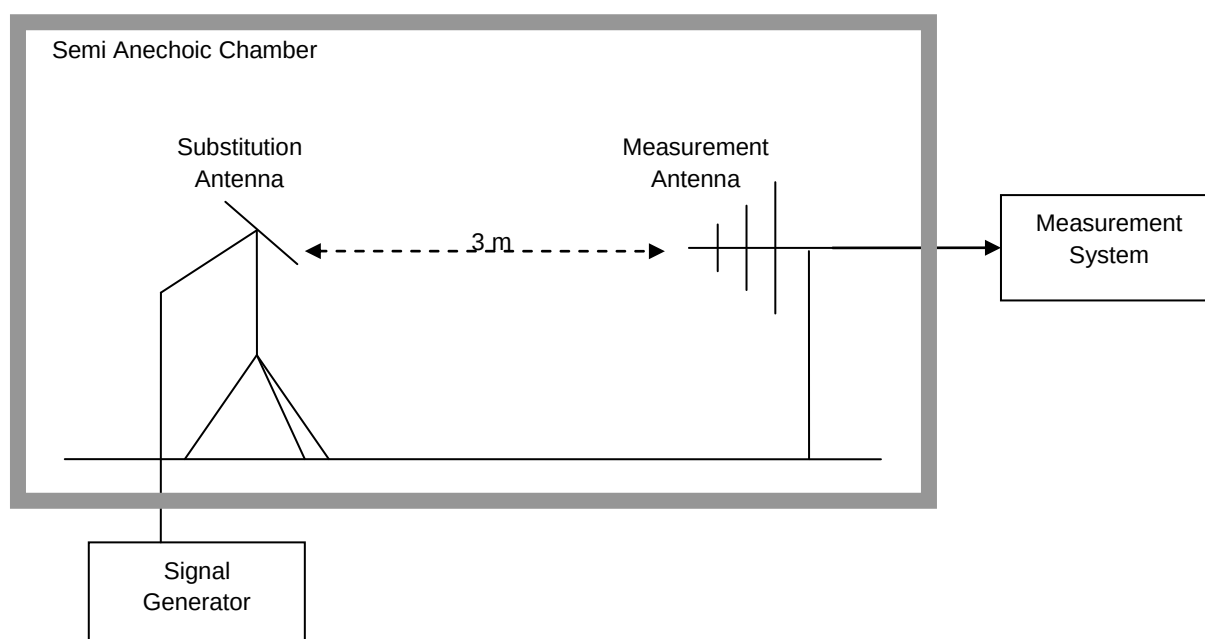
4. Changing EUT working frequency and measuring the RF power at channel T, M, B respectively.

Complete the test data.



Step 2: Substitution method to verify the maximum ERP or EIRP

1. Measurement setup is according to the following figures. EUT was substituted by antenna, and the polarization is identical with the test antenna; the signal generator was connected to the substitution antenna.
2. The radiated output power, measured by signal analyzer set, is the same as recorded in above item 5). Then this power level is matched by a signal from a calibrated signal generator which is substituted for EUT. The power supplied by the generator is then equal to the ERP or EIRP after corrected by the antenna gain and cable loss.



5.5 Test Conditions

Test Case	Test Conditions	
Transmitter Output Power	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1 & Test Setup 3
	Detector	RMS
	RF Channels (TX)	L, M, H
	Test Mode	TM1/TM2
Modulation Characteristics	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	RF Channels (TX)	M
	Test Mode	TM1/TM2
Occupied Bandwidth	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	L, M, H
	Test Mode	TM1/TM2
Band Edges Compliance	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	RMS
	RF Channels (TX)	L, H
	Test Mode	TM1/TM2
Spurious Emission at Antenna Terminals	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	L, M, H
	Test Mode	TM1/TM2
Field Strength of Spurious Radiation	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 3
	Detector	PK
	RF Channels (TX)	M
	Test Mode	TM1/TM2
Frequency Stability	Test Configuration	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) 85%, 100% and 115% of Rated Voltage at Ambient Temperature.
	Test Setup	Test Setup 2
	RF Channels (TX)	M



Test Case	Test Conditions	
	Test Mode	TM1/TM2

6 Main Test Instruments

Table 3 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sept., 27,2012
Universal Radio Communication Tester	R&S	CMU200	117341	Jan., 12,2013
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug., 31,2012
Spectrum Analyzer	Agilent	E4440A	MY49420179	Jul., 17,2013
Signal Analyzer	R&S	FSQ31	200021	Sept., 27,2012
Temperature Chamber	WEISS	WKL64	24600294	Feb.,13,2013
Signal generator	Agilent	E8257D	MY49281095	Jul.,09,2013
Spectrum analyzer	R&S	FSU3	200474	Mar., 05, 2013
Spectrum analyzer	R&S	FSU43	100144	Mar., 05, 2013
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100304	Apr., 05, 2013
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100391	Apr., 05, 2013
Trilog Broadband Antenna (30M~3GHz)	SCHWARZBECK	VULB 9163	9163-521	Jul., 07, 2013
Pyramidal Horn Antenna(26GHz-40GHz)	ETS-Lindgren	3160-10	00123940	Feb., 27, 2013
Pyramidal Horn Antenna(18GHz-26.5GHz)	ETS-Lindgren	3160-09	00125912	Feb., 27, 2013

Note: All the equipments are calibrated once a year. When it's almost due, we will arrange calibration again before the calibration deadline.

7 Test Results

No.	Test Item	Test Result
1	Transmitter Output Power	Appendix A
2	Modulation Characteristics	Appendix B
3	Occupied Bandwidth	Appendix C
4	Band Edges Compliance	Appendix D
5	Spurious Emission at Antenna Terminals	Appendix E
6	Field Strength of Spurious Radiation	Appendix F
7	Frequency Stability	Appendix G
8	Photos of Test Setup	Appendix H

NOTE: There is no test data in Appendix H, only Photos of Test Setup for Field Strength of Spurious Radiation.

8 Measurement Uncertainty

For a 95% confidence level ($k=2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmitter Output Power	Power (dBm)	U =0.39 dB
Occupied Bandwidth	Magnitude (%)	U=0.2%
Band Edge Compliance	Disturbance Power (dBm)	U=2.0 dB
Conducted Spurious Emissions	Disturbance Power (dBm)	U=2.0 dB
Field Strength of Spurious Radiation	ERP (dBm)	U=4.6 dB (30 MHz – 1GHz) U=3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy (ppm)	U=0.21 ppm

-----The END-----



Appendix A

Transmitter Output Power According to FCC Part 2.1046 & Part 24.232



Conducted Power of Transmitter

TEST CONDITIONS	RF Output Power (Conducted)					
	Channel512(L)		Channel661(M)		Channel810(H)	
	1850.2MHz		1880.0MHz		1909.8MHz	
	dBm		dBm		dBm	
T_{nom} / V_{nom}	Measured	Limit	Measured	Limit	Measured	Limit
TM1	30.89	33	30.88	33	30.93	33
TM2	26.13	33	26.04	33	25.92	33



Peak-to-Average Ratio

	Peak-to-Average Ratio					
TEST CONDITIONS	Channel512(L)		Channel661(M)		Channel810(H)	
	1850.2MHz		1880.0MHz		1909.8MHz	
	dB		dB		dB	
T_{nom} / V_{nom}	Measured	Limit	Measured	Limit	Measured	Limit
TM1	0.3	13	0.3	13	0.4	13
TM2	3.3	13	3.2	13	3.4	13



Effective Isotropic Radiated Power of Transmitter (EIRP)

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (EIRP)	FCC limit [dBm]	Result
							[dBm]		
TM1	1850.2	31.79	Horn Ant.	28.09	4.5	1	31.59	33	Pass
TM1	1880.0	31.78	Horn Ant.	28.46	4.5	1	31.96	33	Pass
TM1	1909.8	31.83	Horn Ant.	27.88	4.8	1	31.68	33	Pass
TM2	1850.2	27.03	Horn Ant.	23.67	4.5	1	27.17	33	Pass
TM2	1880.0	26.94	Horn Ant.	23.52	4.5	1	27.02	33	Pass
TM2	1909.8	26.82	Horn Ant.	23.05	4.8	1	26.85	33	Pass

Note: a, For getting the EIRP (Efficient Isotropic Radiated Power) in substitution method, the following formula should be taken to calculate it,

$$\text{EIRP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBi]}$$

b, SGP=Signal Generator Level

-----The END-----



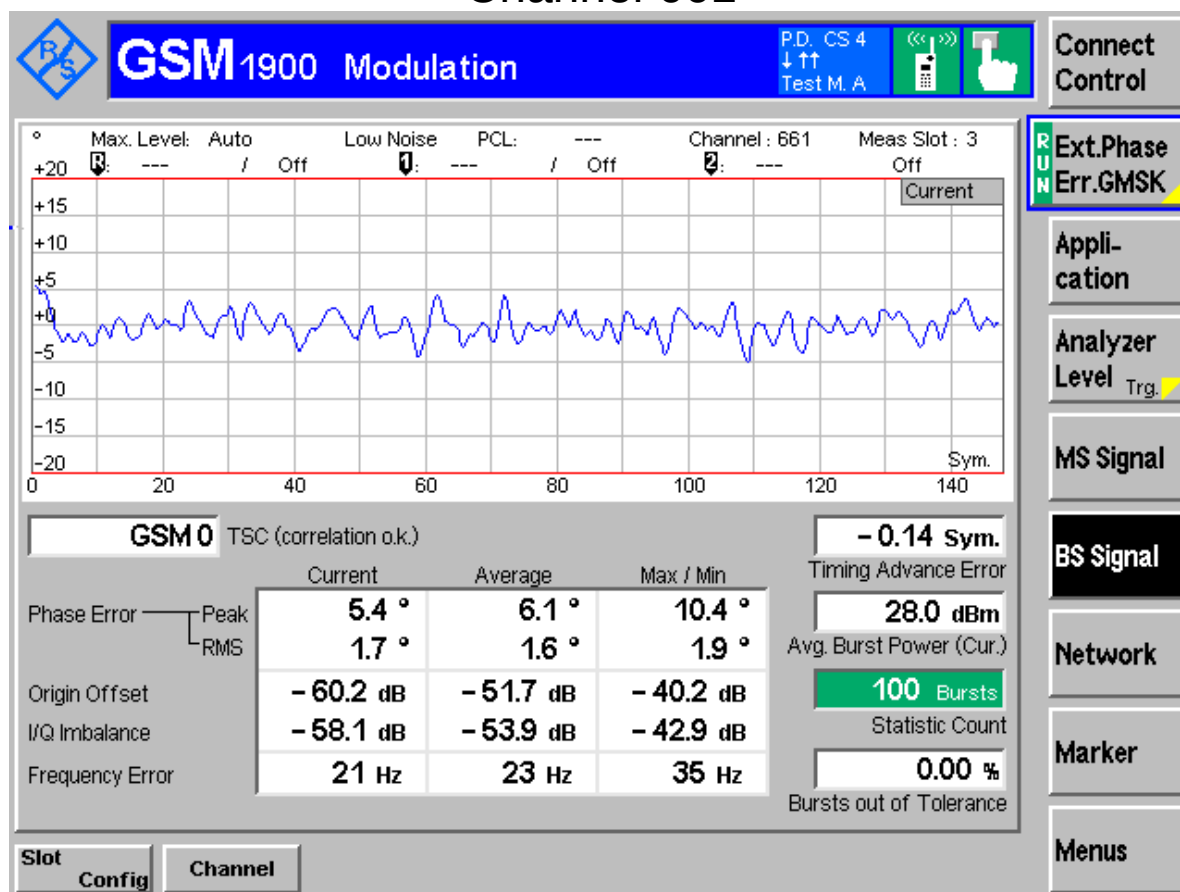
Appendix B

Modulation Characteristics

According to FCC Part 2.1047 & Part24 Subpart E

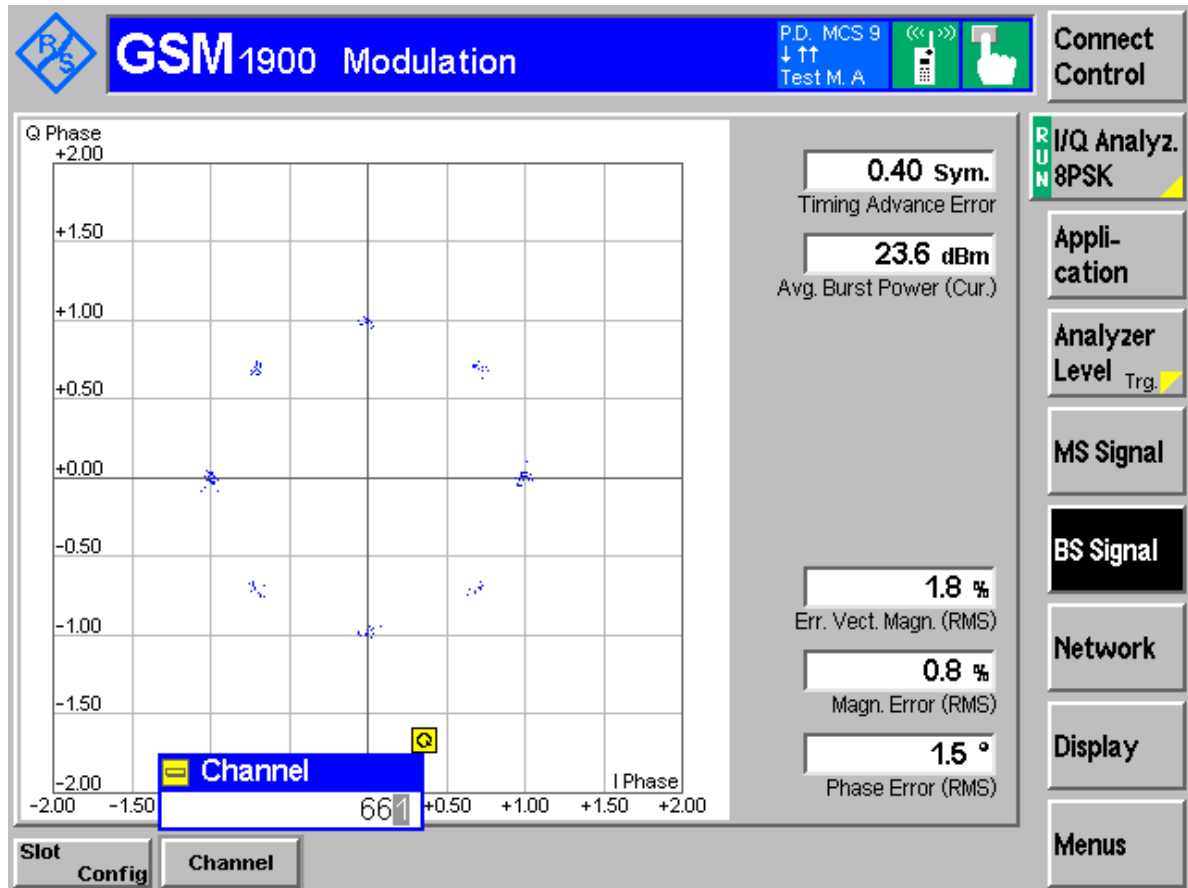


TM1:GPRS/GSM Channel 661





TM2:EDGE Channel 661



-----The END-----



Appendix C

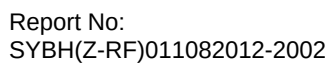
Occupied Bandwidth According to FCC Part 2.1049 & Part 24 Subpart E



Result Table

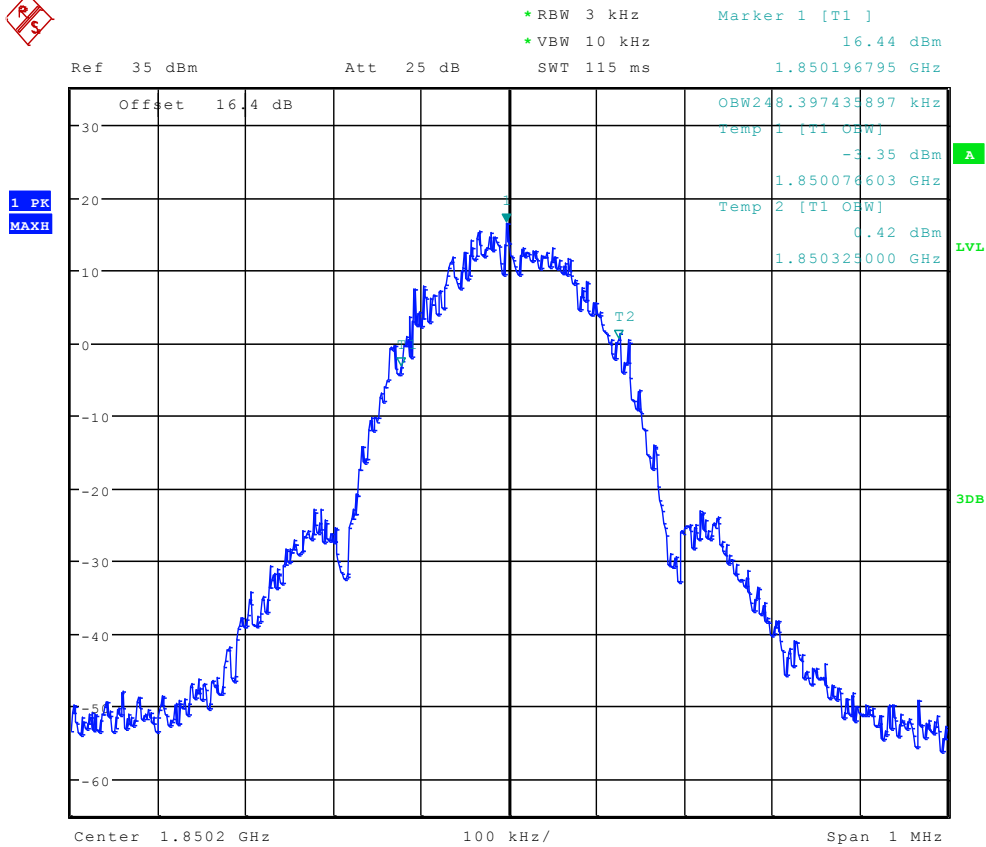
Table 1 Measurement Results

Test Mode	RF Channel	Occupied Bandwidth [kHz]	Verdict
TM1	512	241.99	Pass
	661	248.40	Pass
	810	240.38	Pass
TM2	512	248.40	Pass
	661	245.19	Pass
	810	240.38	Pass



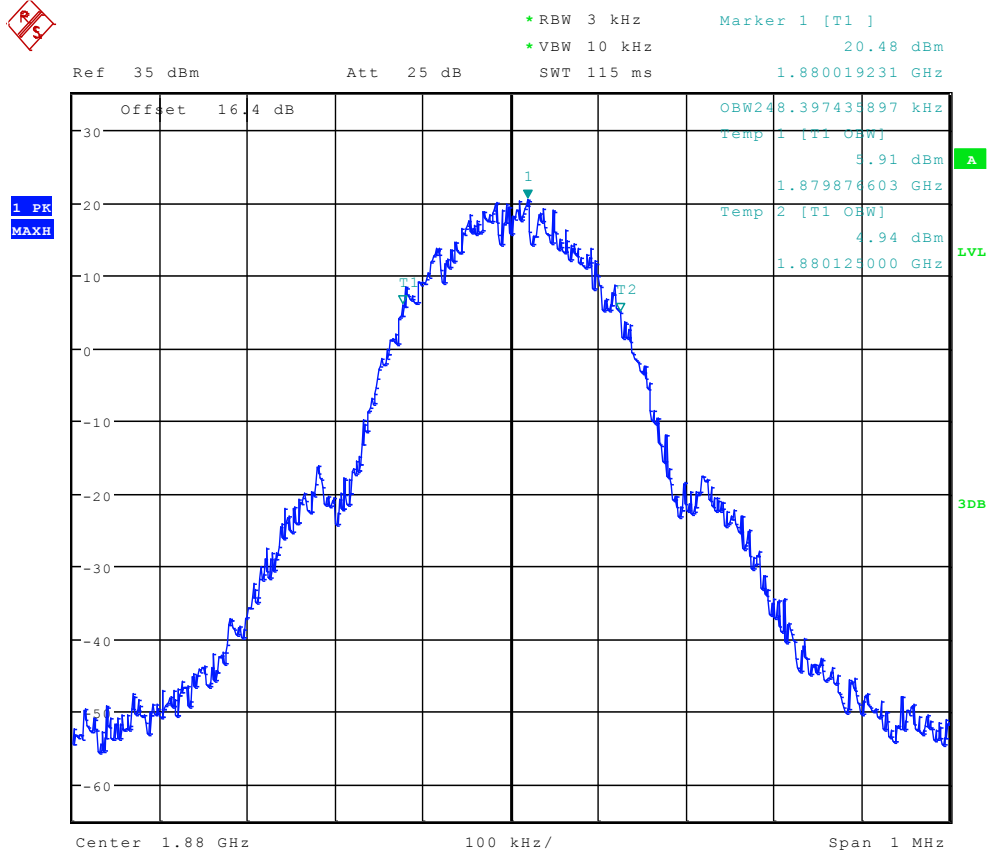


TM2:EDGE Channel 512



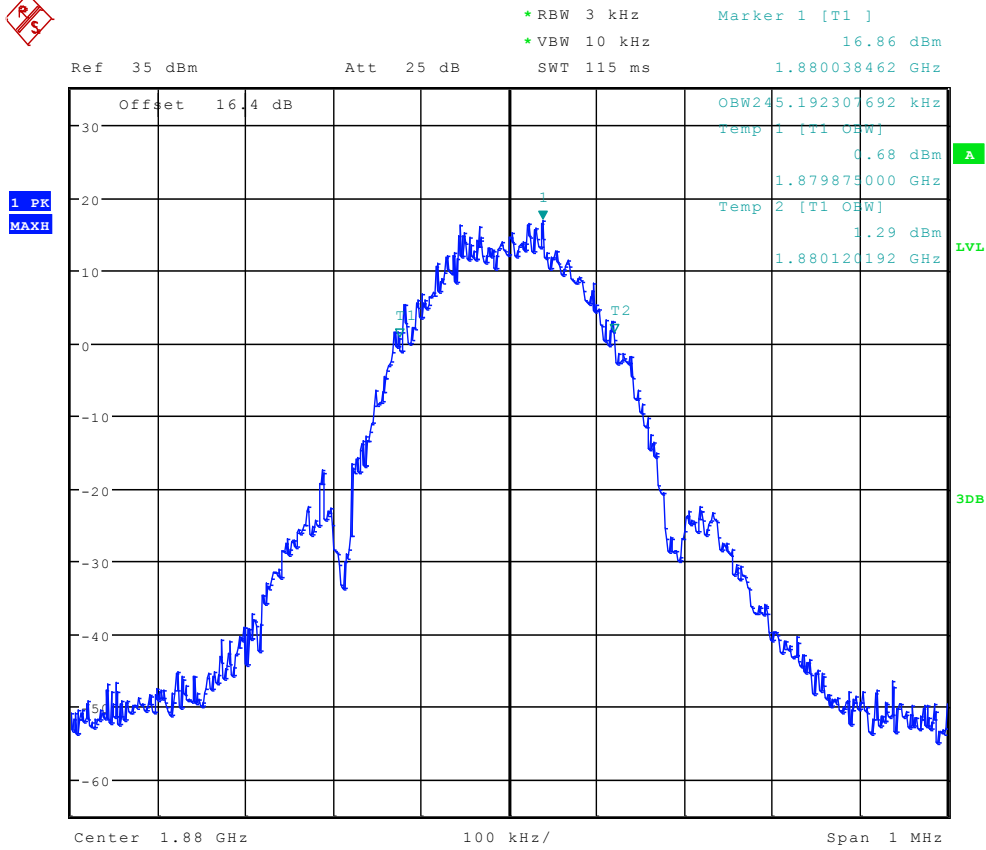


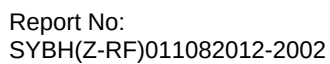
TM1:GPRS/GSM Channel 661





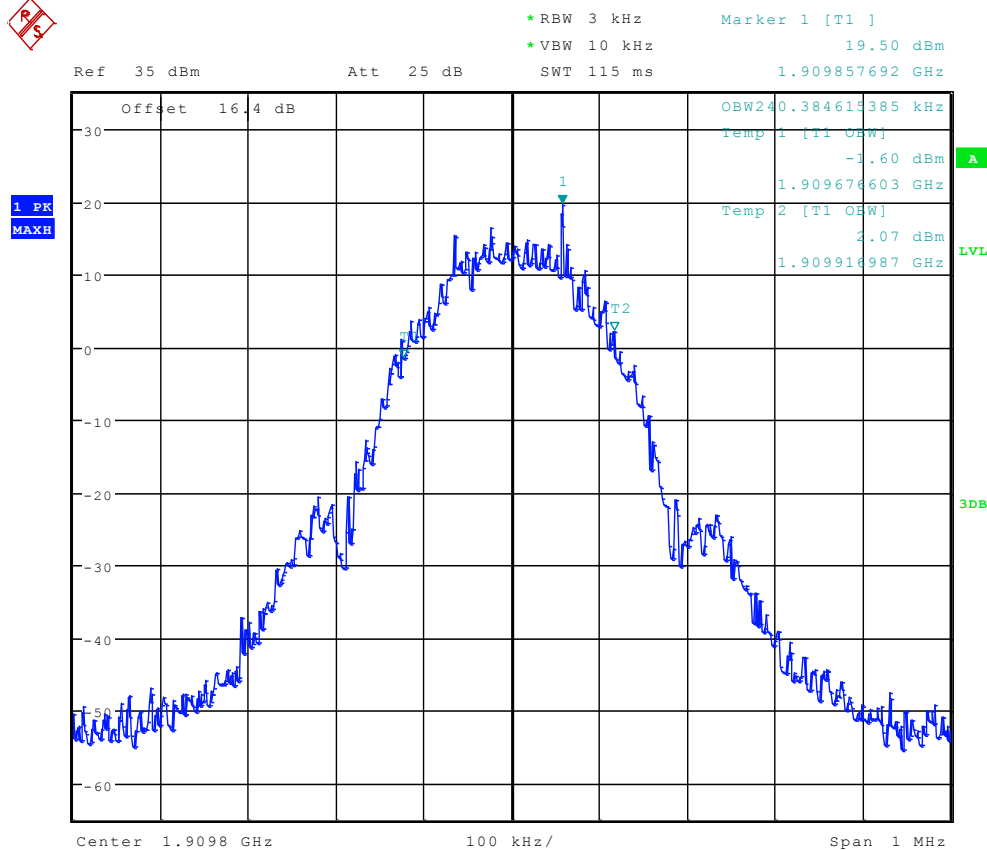
TM2:EDGE Channel 661







TM2:EDGE Channel 810



-----END-----



Appendix D

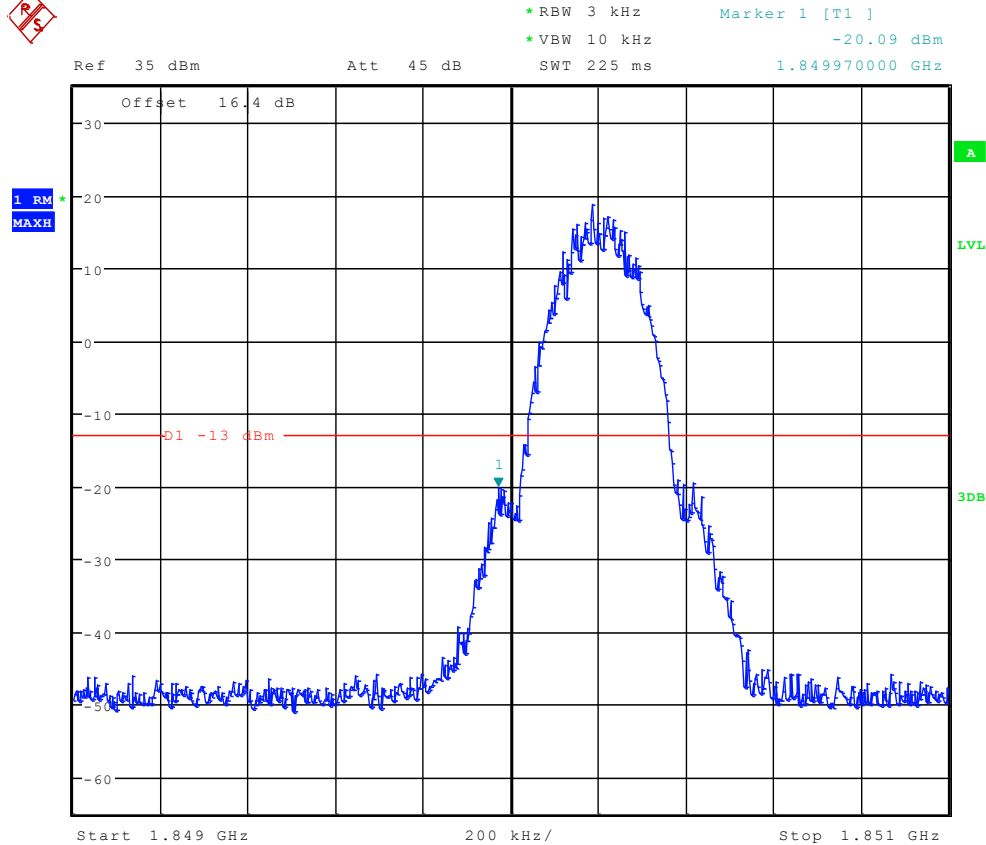
Band Edges Compliance According to FCC Part 2.1051 & 24.238



TM1:GPRS/GSM

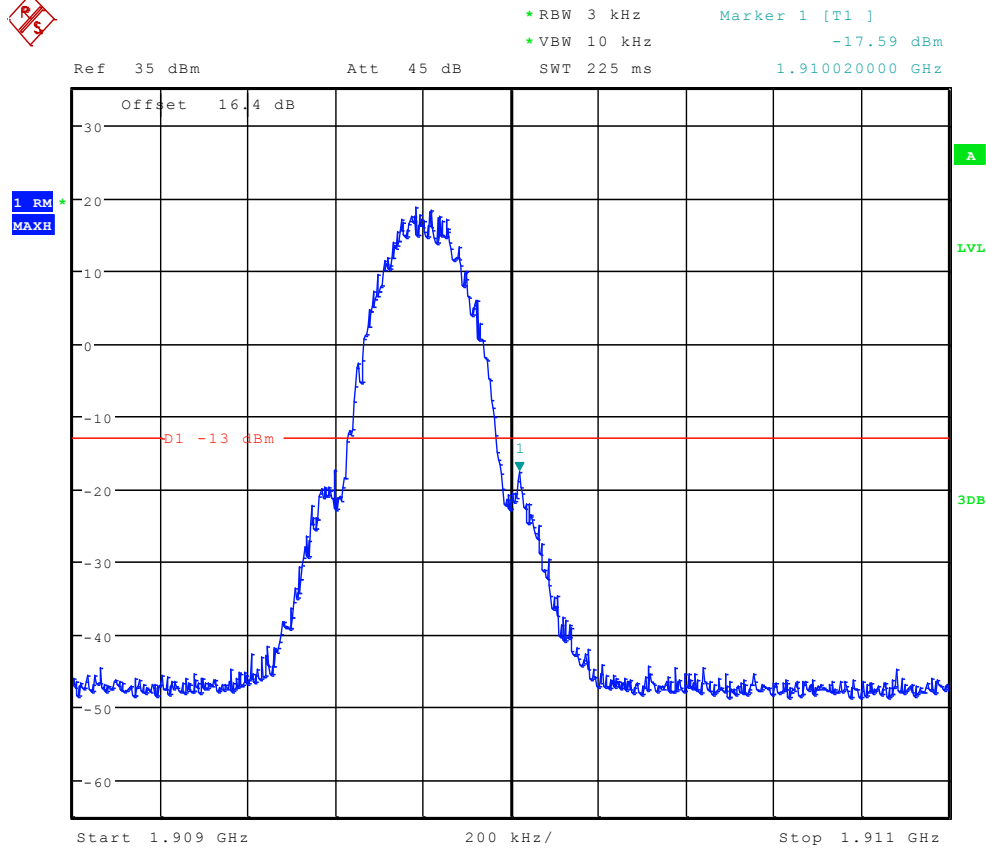
Left Edge

Channel 512



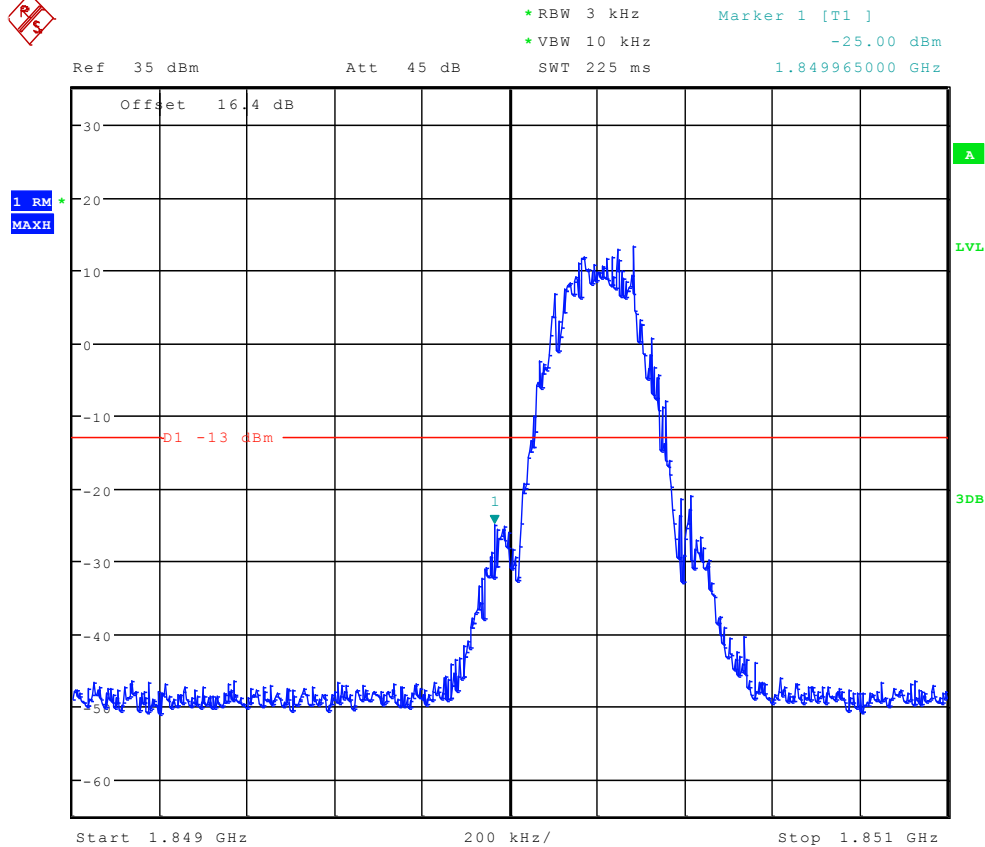


Right Edge Channel 810



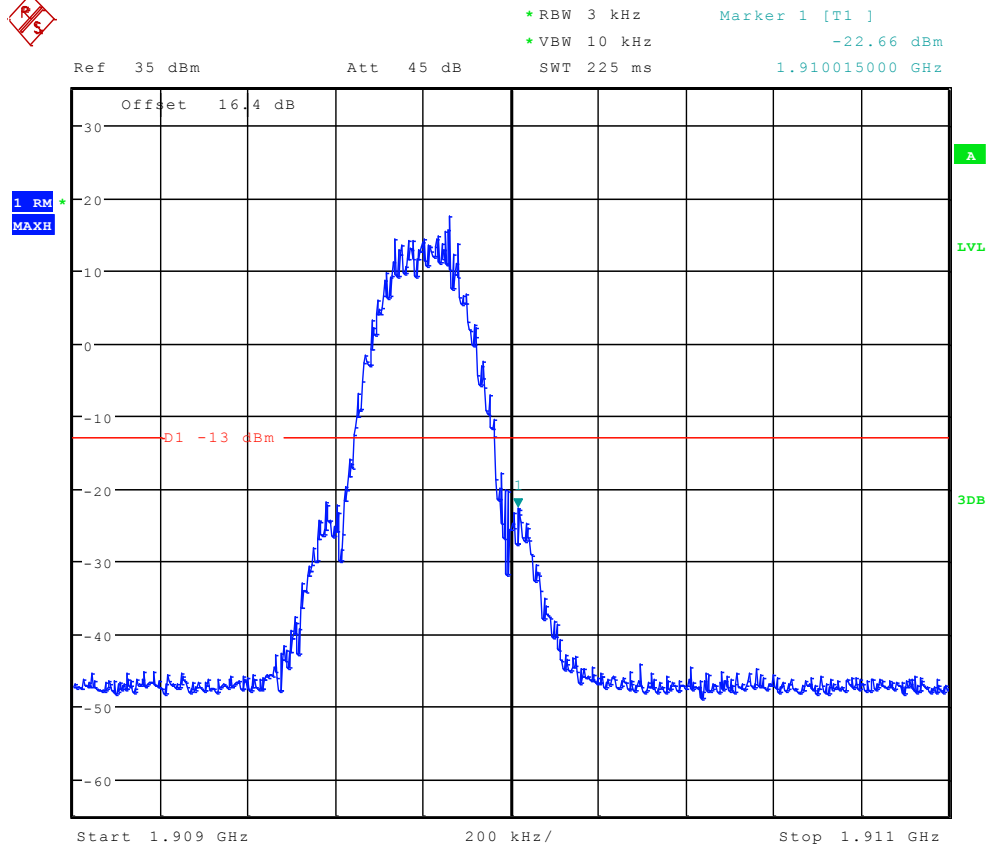


TM2:EDGE Left Edge Channel 512





Right Edge Channel 810



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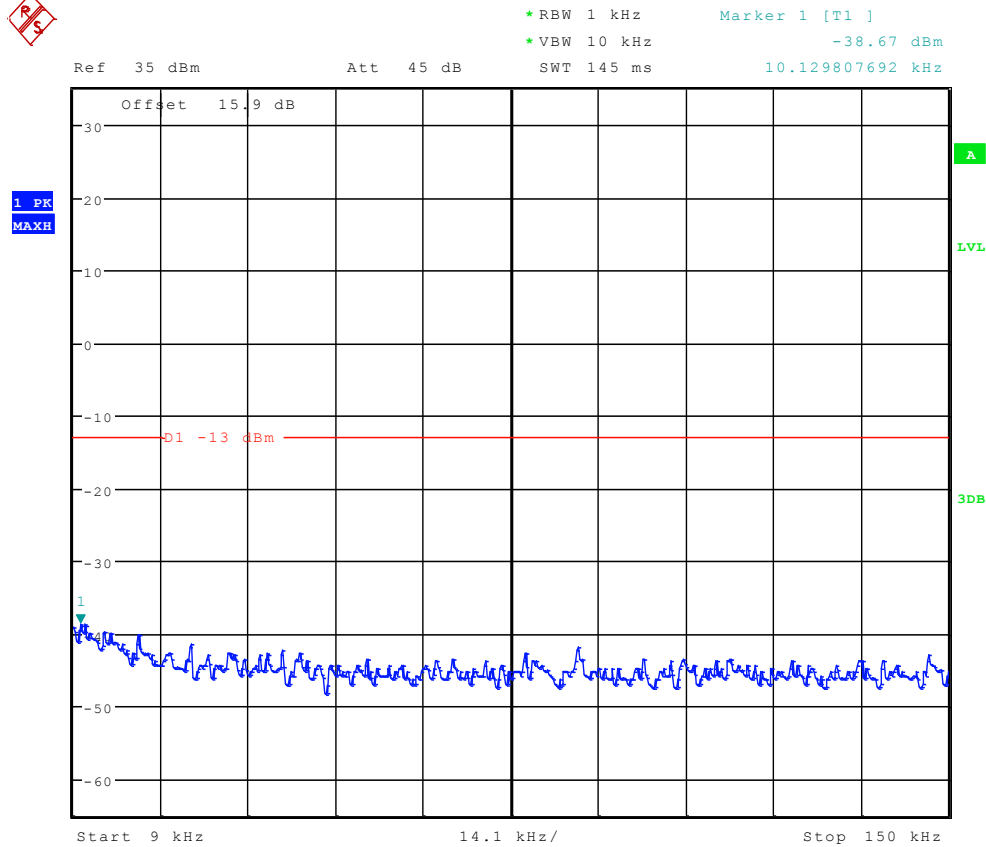
Appendix E

Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & 24.238



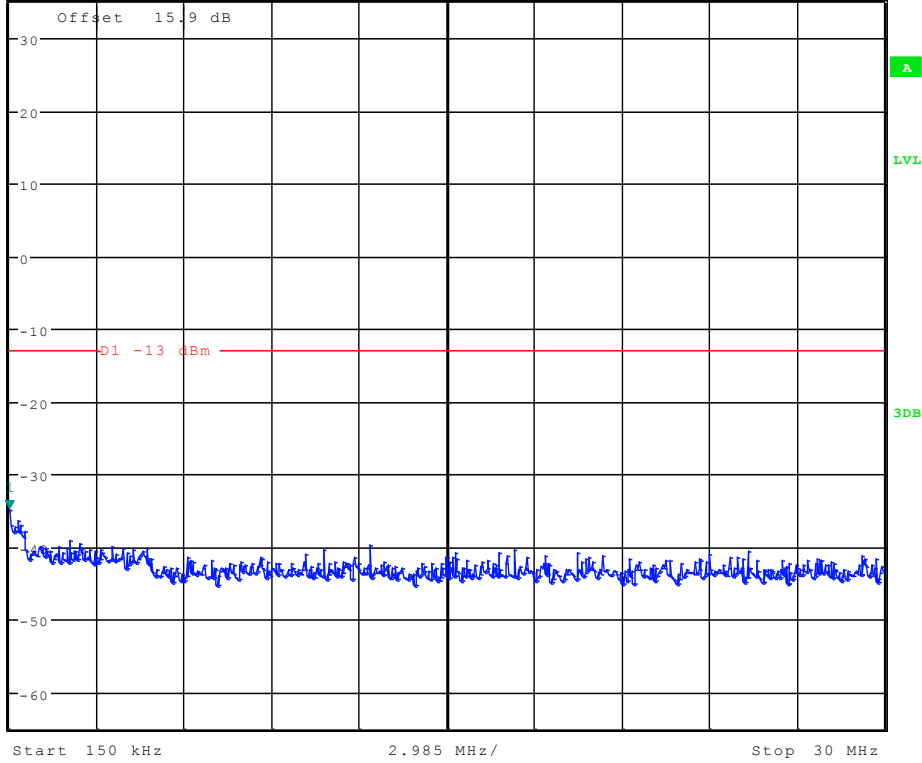
TM1:GPRS/GSM Channel 512





1 PK
MAXH

*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -34.83 dBm
Ref 35 dBm Att 45 dB SWT 300 ms 150.00000000 kHz





Ref 35 dBm Att 45 dB SWT 115 ms 1.822179487 GHz

Offset 16.1 dB

D1 -13 dBm

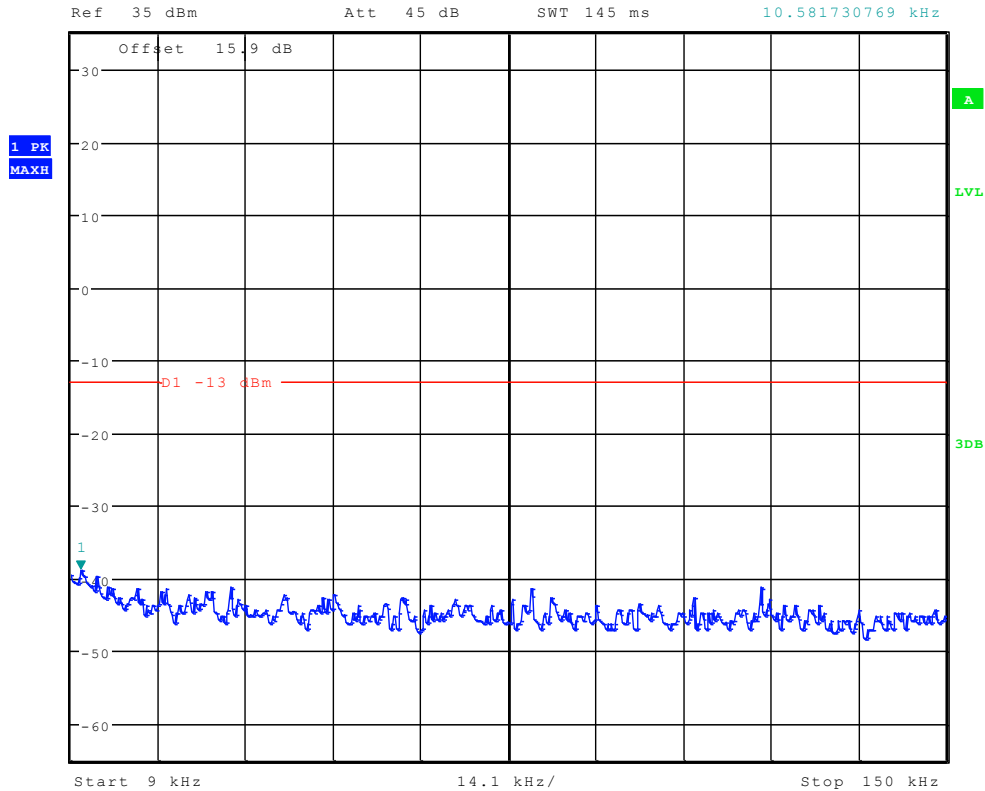
Start 30 MHz 1.997 GHz/ Stop 20 GHz



Channel 661

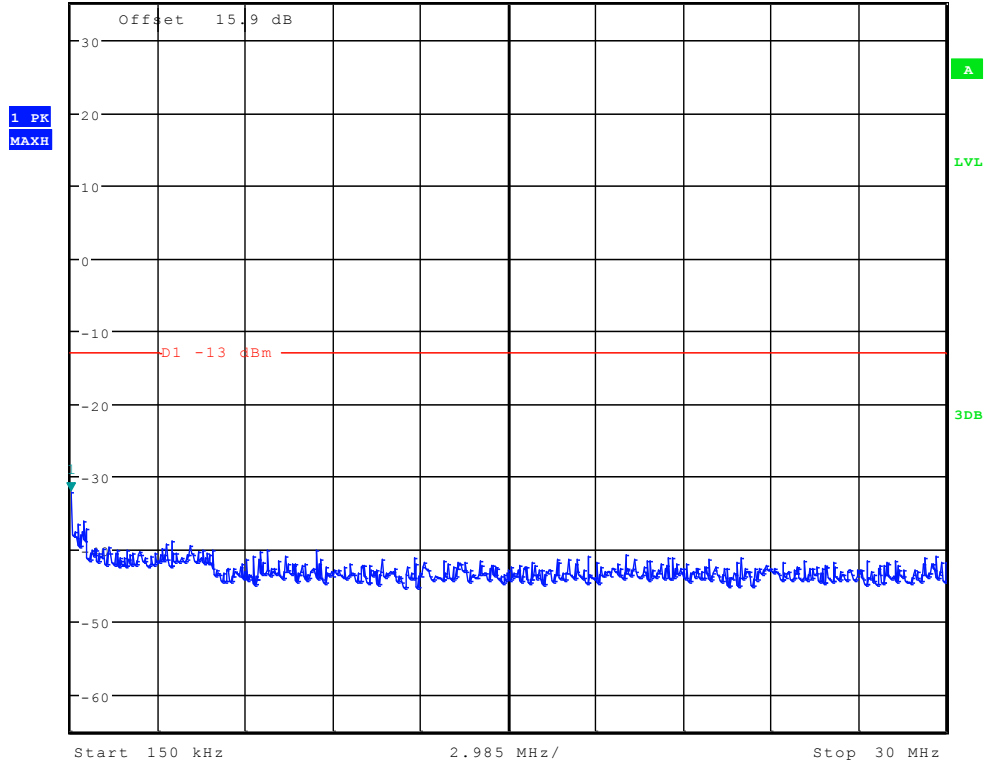


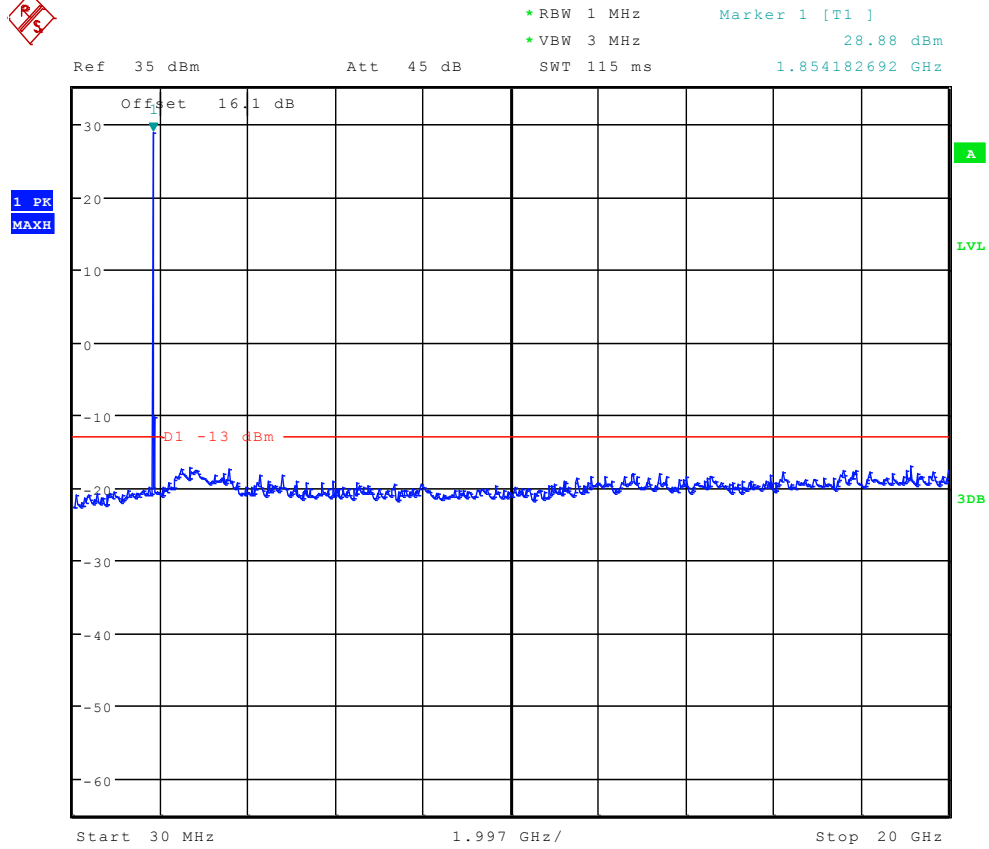
*RBW 1 kHz Marker 1 [T1]
*VBW 10 kHz -38.87 dBm
SWT 145 ms 10.581730769 kHz





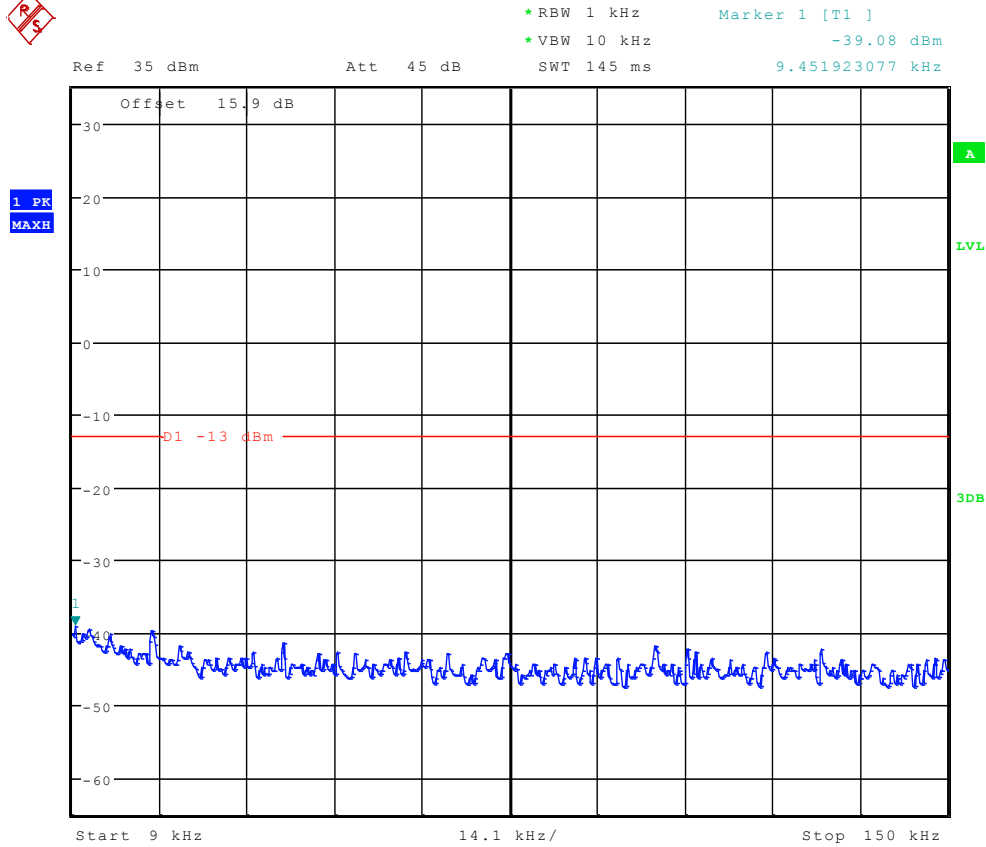
*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -32.03 dBm
Ref 35 dBm Att 45 dB SWT 300 ms 150.000000000 kHz





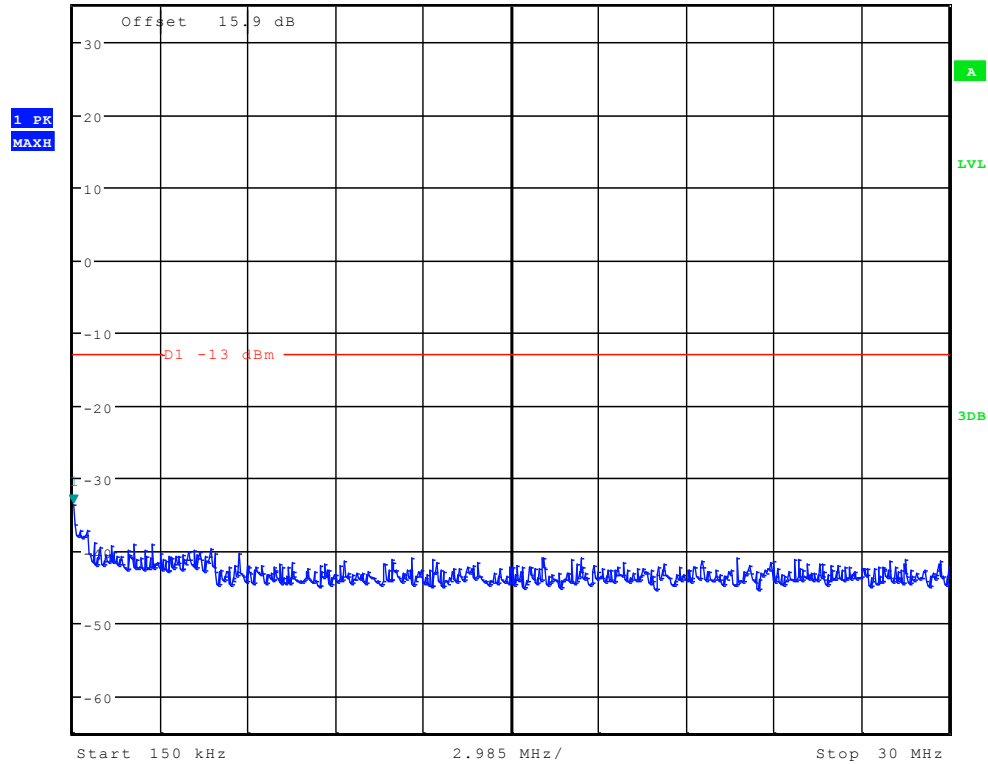


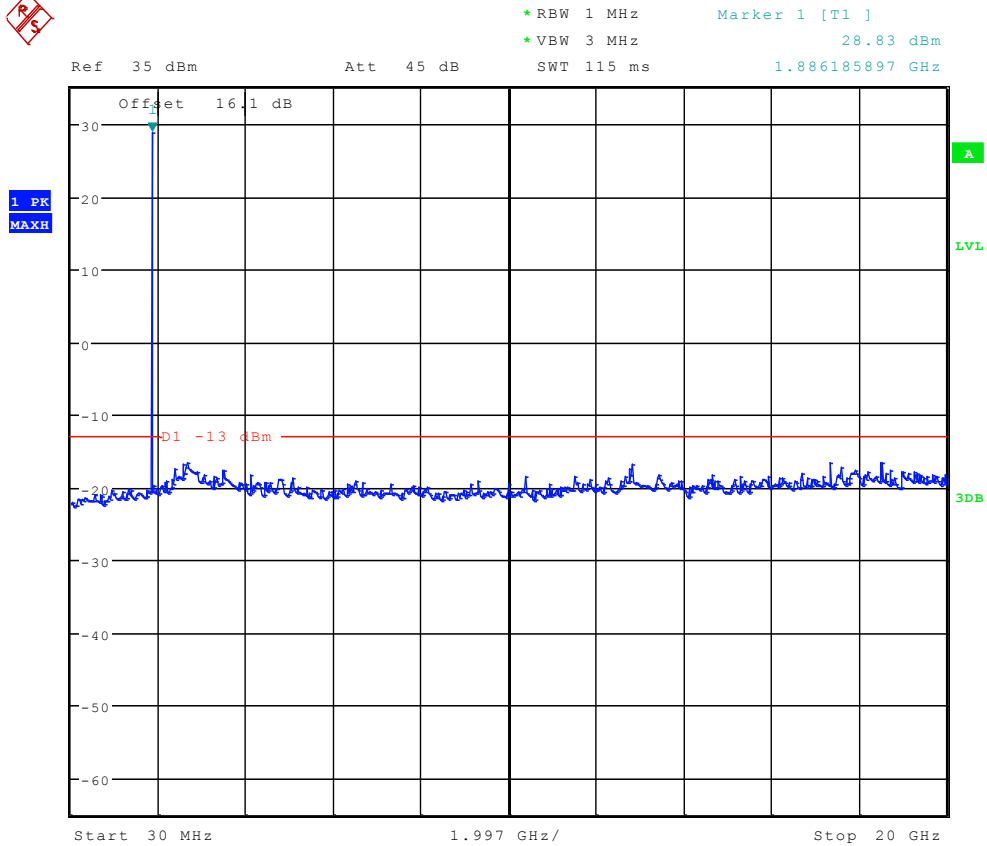
Channel 810





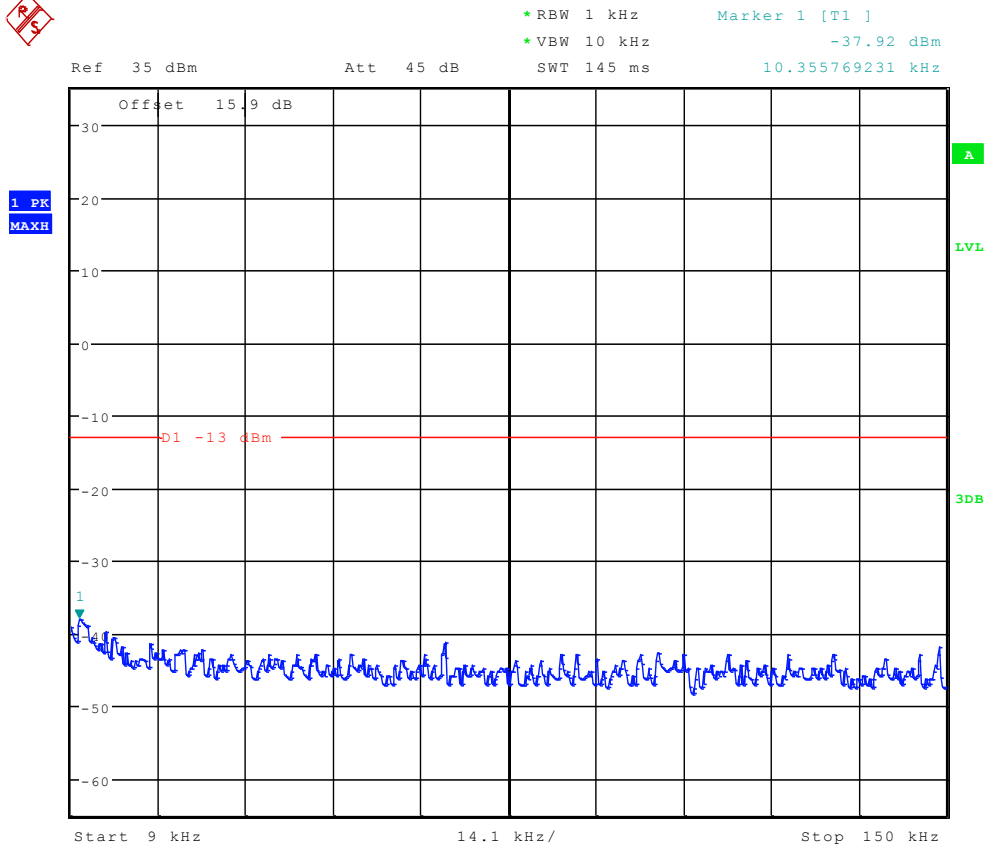
* RBW 10 kHz Marker 1 [T1]
* VBW 30 kHz -33.64 dBm
Ref 35 dBm Att 45 dB SWT 300 ms 150.00000000 kHz





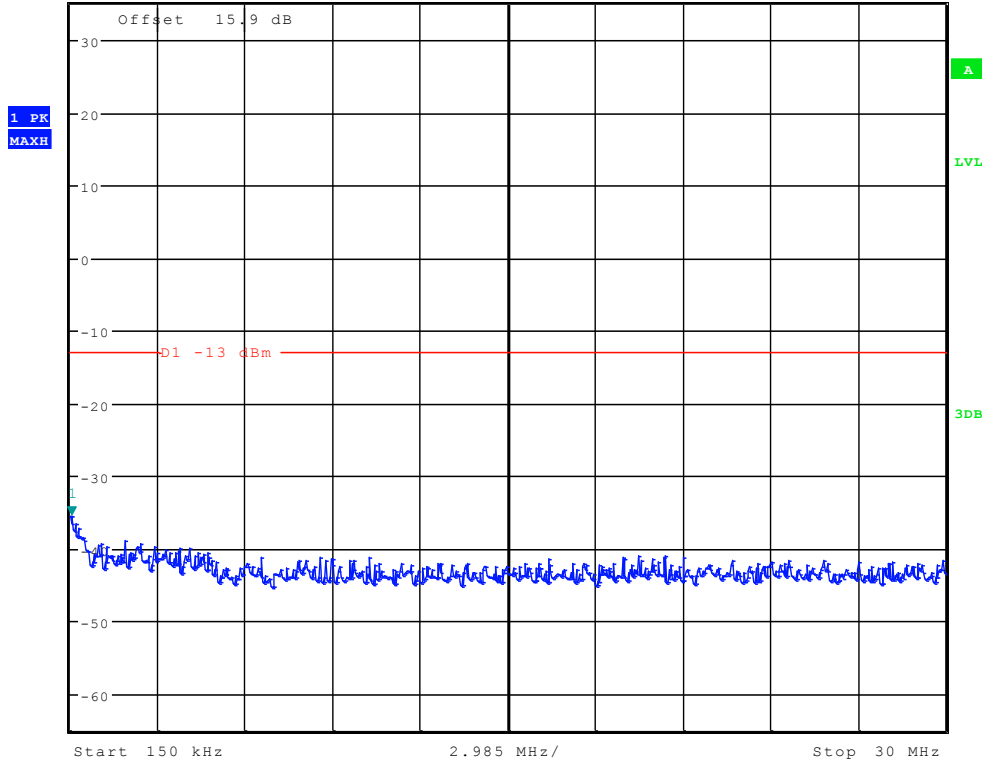


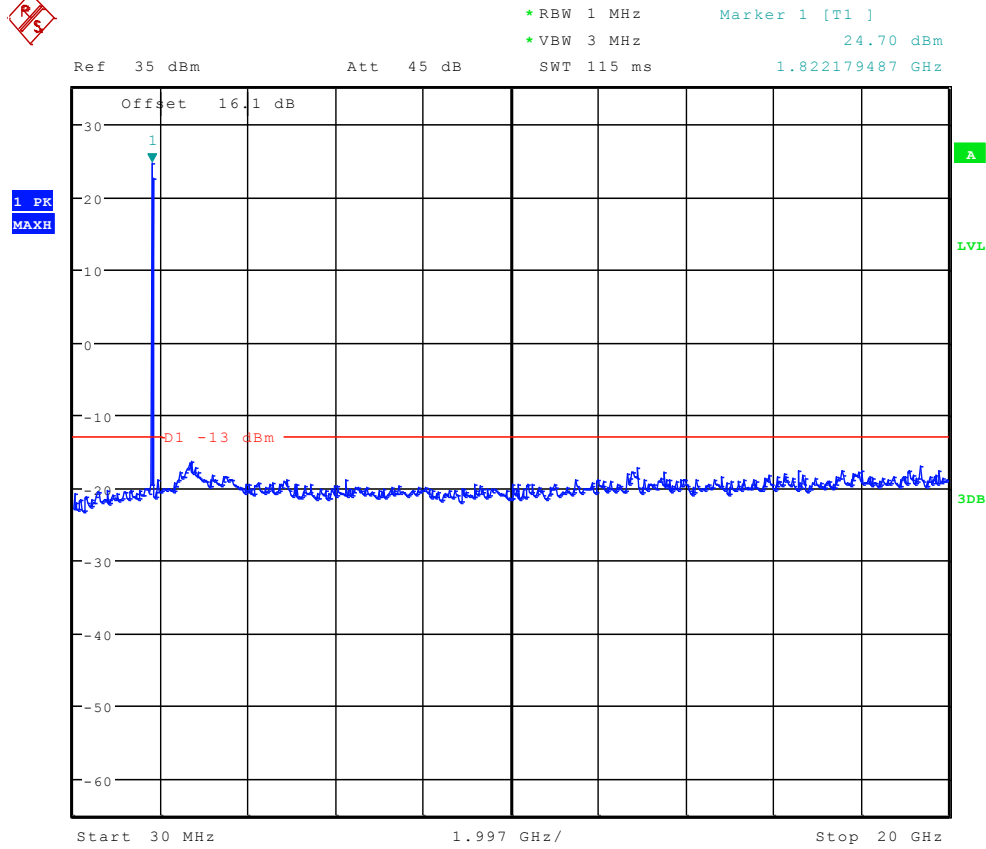
TM2:EDGE Channel 512





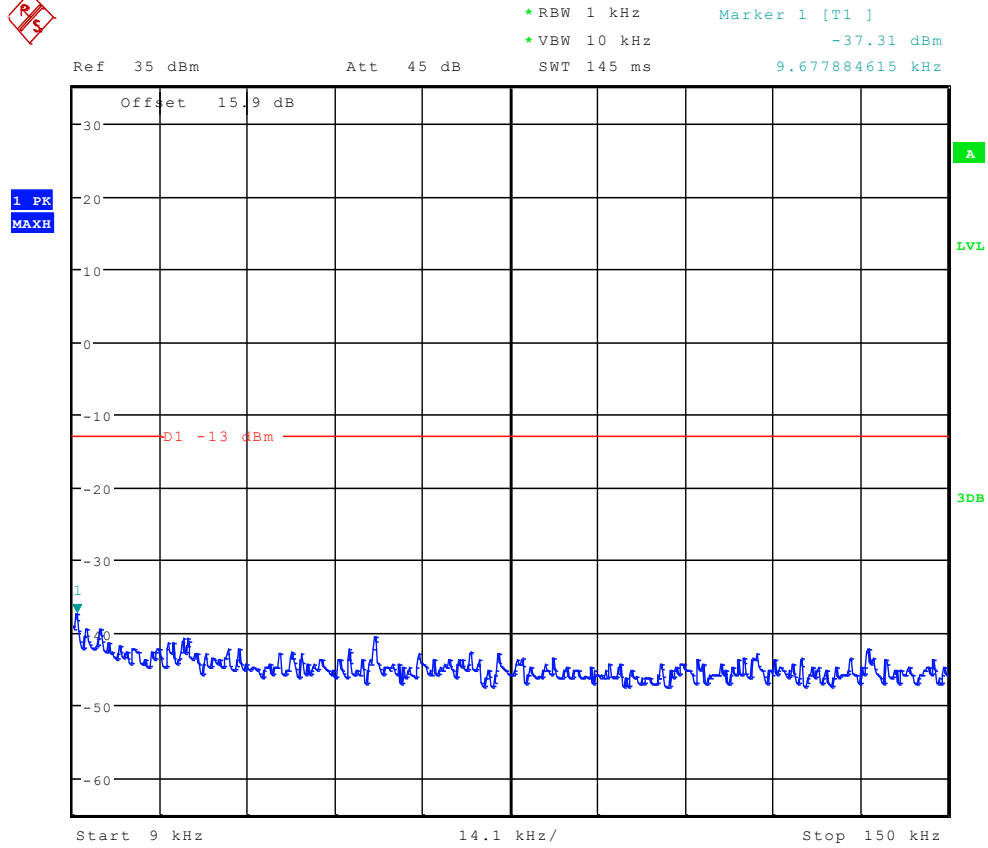
*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -35.42 dBm
Ref 35 dBm Att 45 dB SWT 300 ms 197.836538462 kHz





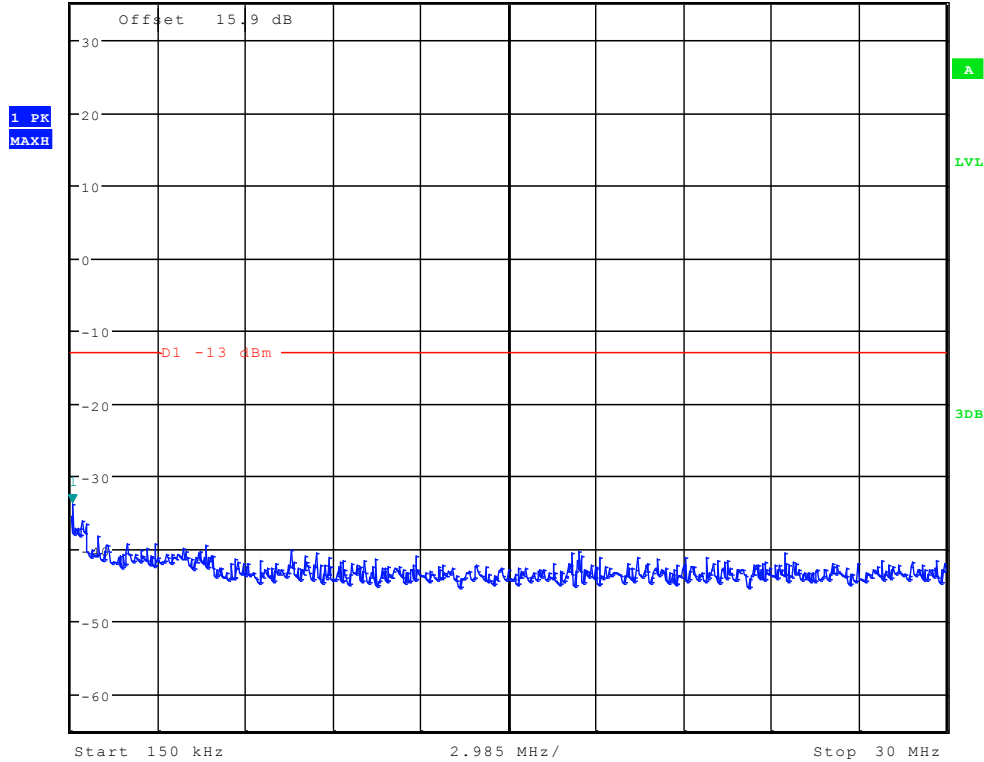


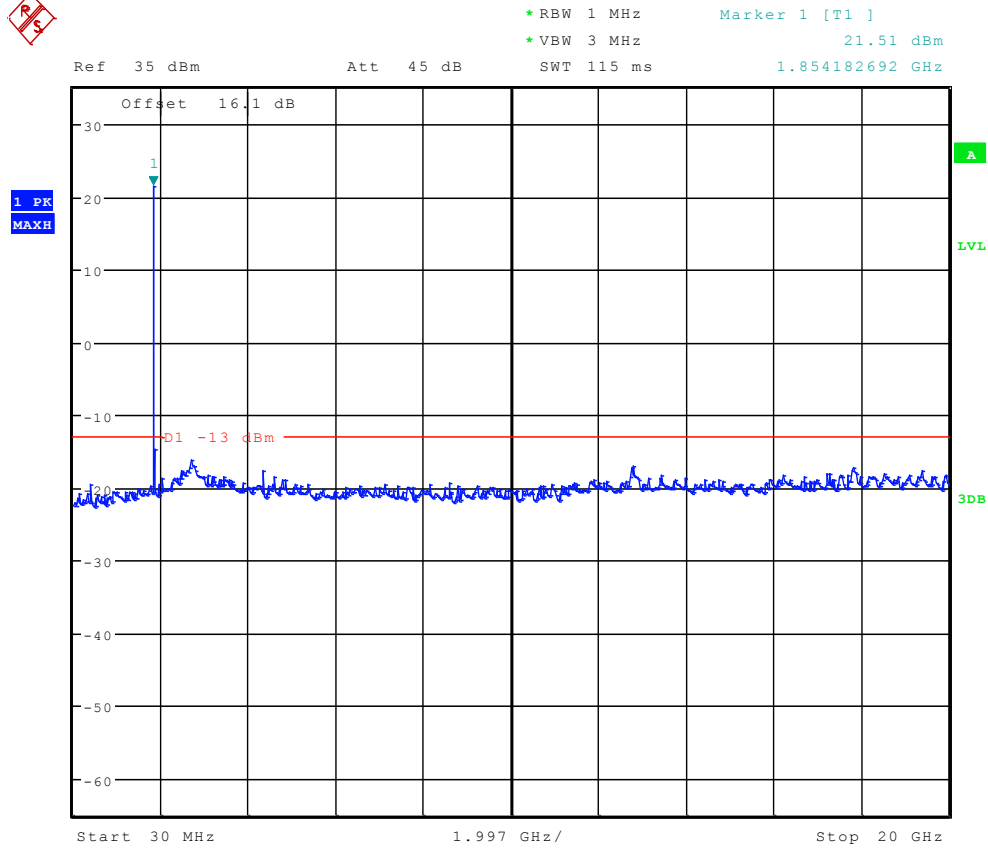
Channel 661





*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -33.76 dBm
Ref 35 dBm Att 45 dB SWT 300 ms 197.836538462 kHz



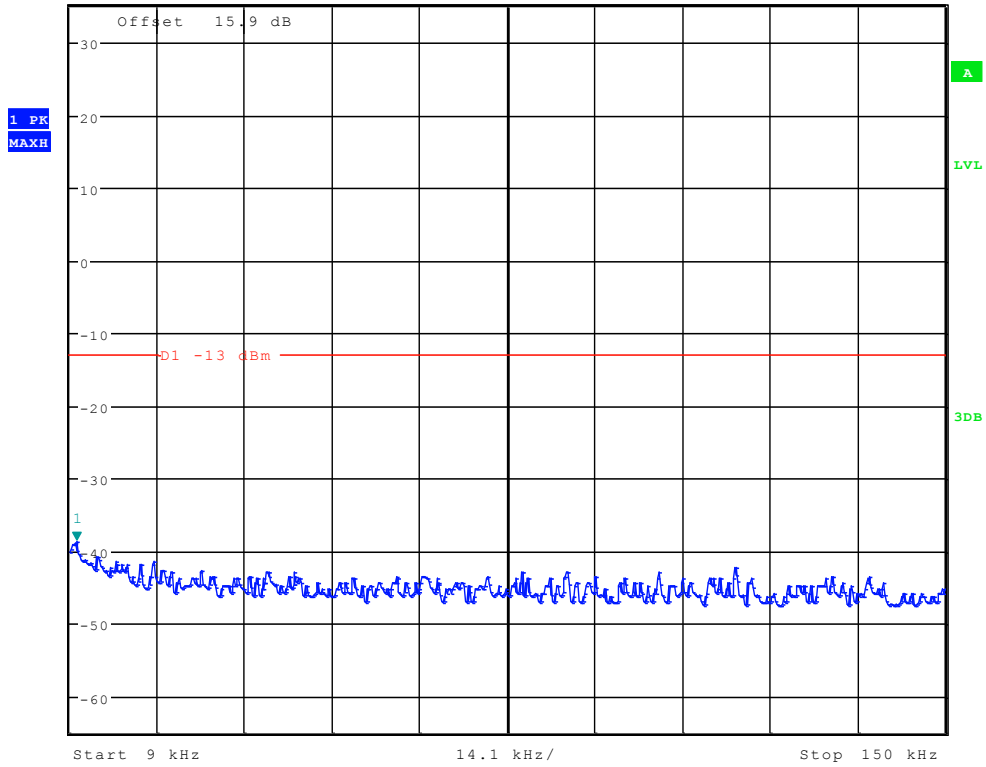




Channel 810

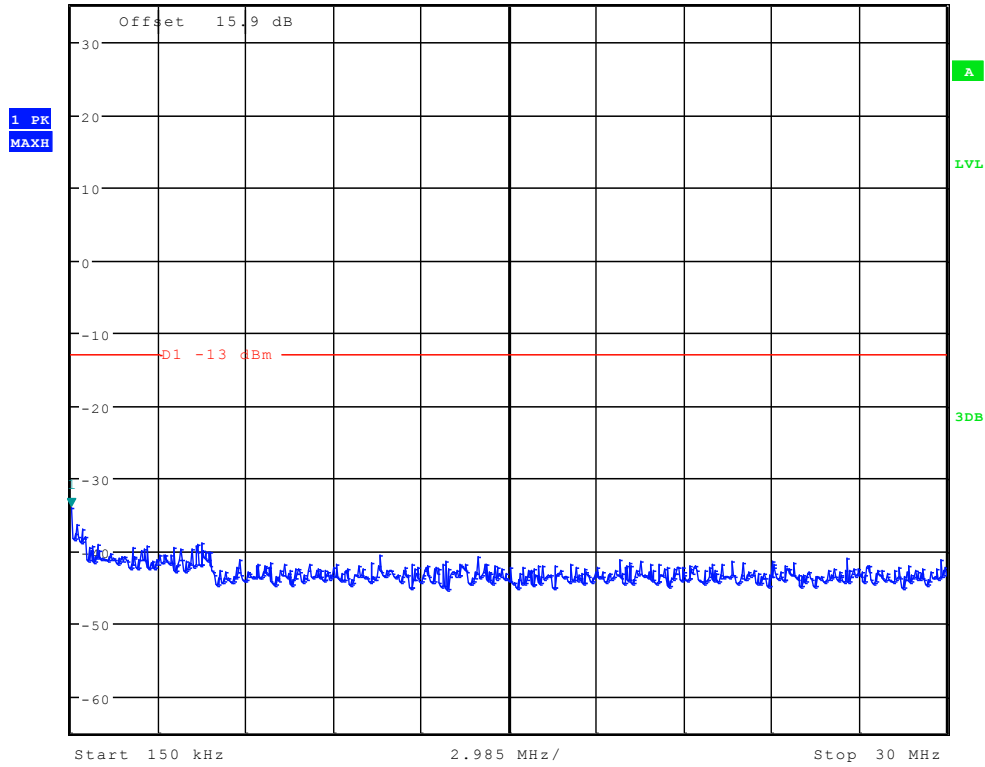


*RBW 1 kHz Marker 1 [T1]
*VBW 10 kHz -38.67 dBm
Ref 35 dBm Att 45 dB SWT 145 ms 10.129807692 kHz



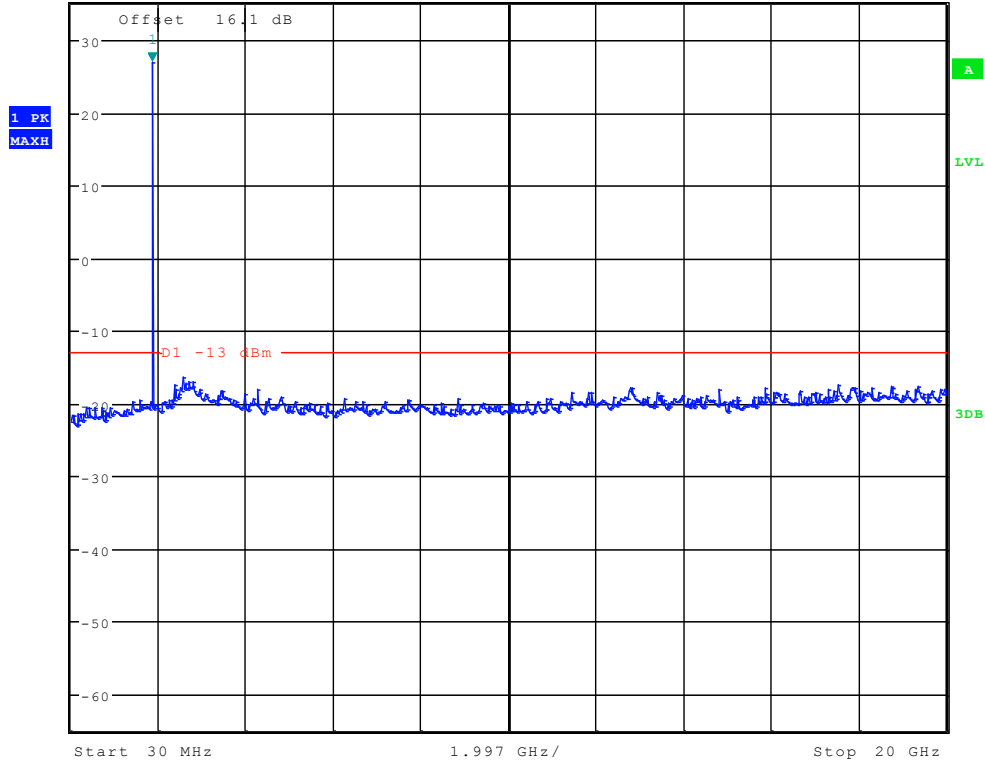


*RBW 10 kHz Marker 1 [T1]
*VBW 30 kHz -34.10 dBm
Ref 35 dBm Att 45 dB SWT 300 ms 150.00000000 kHz





Ref	35 dBm	Att	45 dB	SWT	115 ms	1.886185897 GHz
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-----END-----



Appendix F

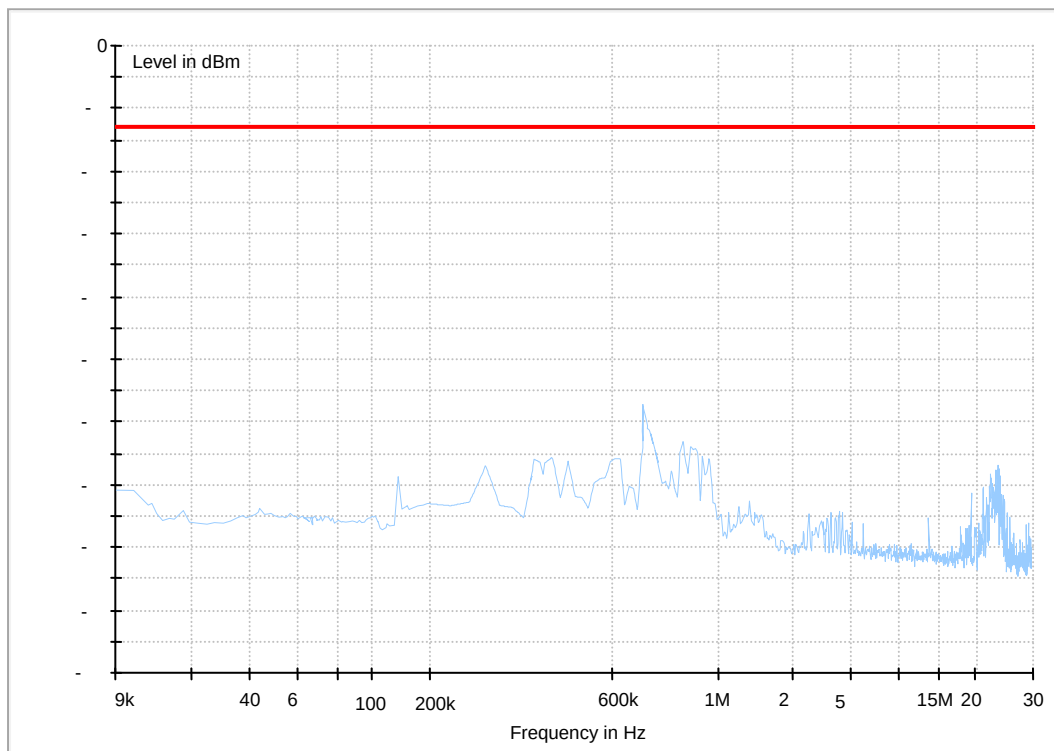
Radiated spurious emission

According to FCC Part 2.1053& Part 24.238

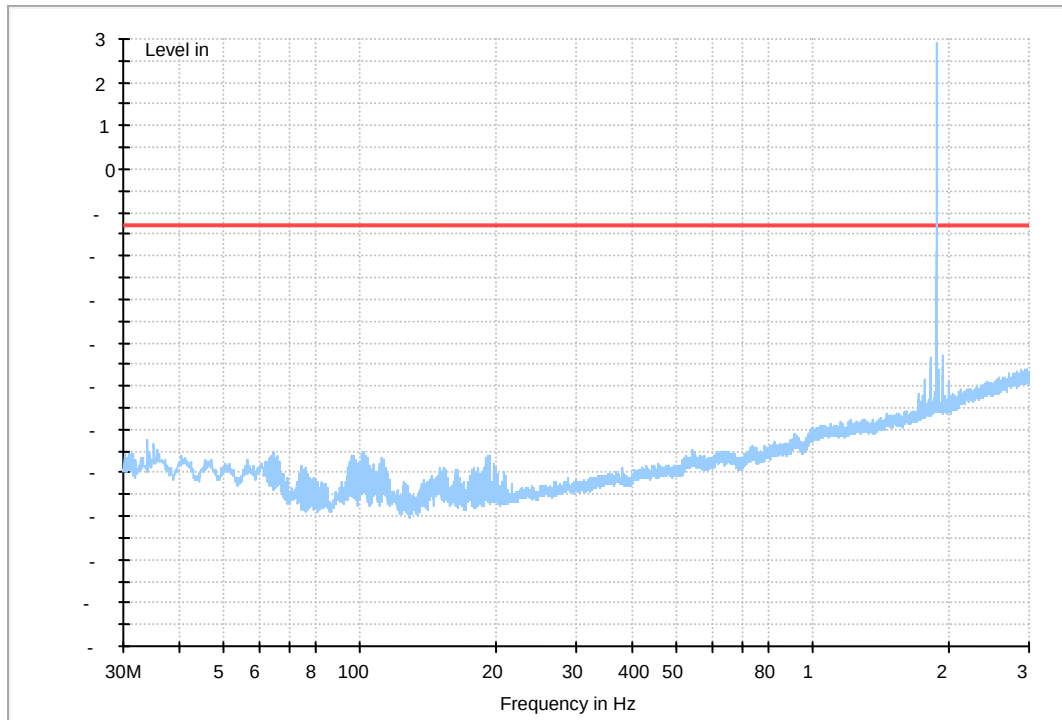
Note: 1. Simultaneous transmission was investigated and no new emissions were found.
2. $RBW \geq 1\text{MHz}$, $VBW > 3 \times RBW$.

GSM 1900

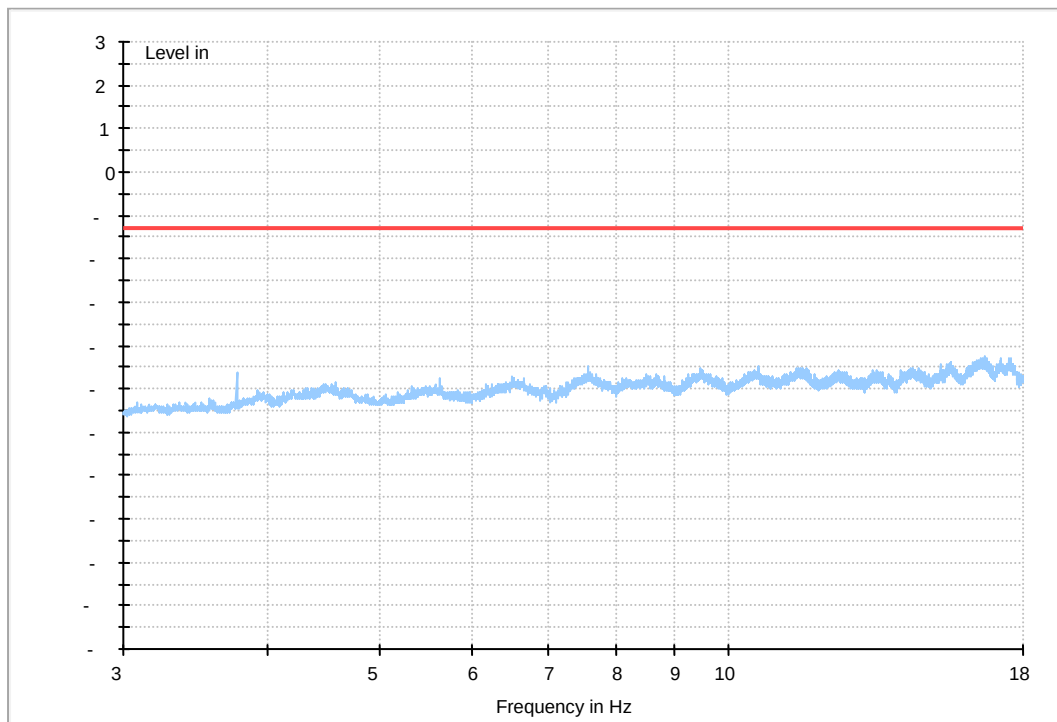
(9kHz-30MHz)



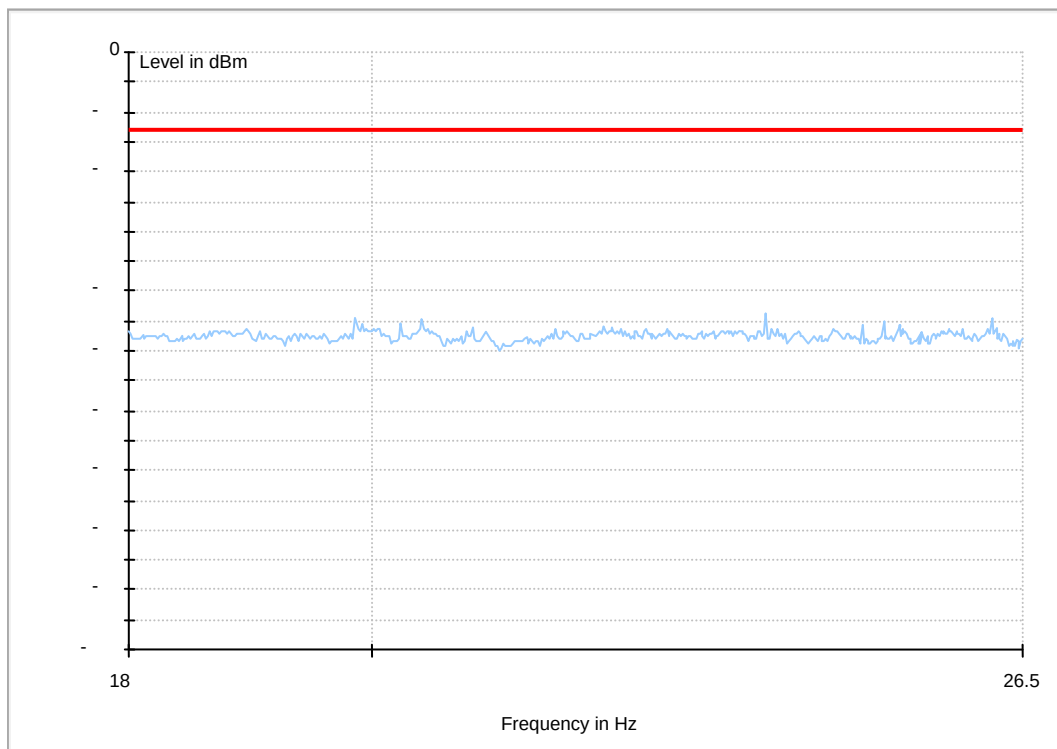
Traffic Mode (30MHz-3GHz)



Traffic Mode (3GHz-18GHz)

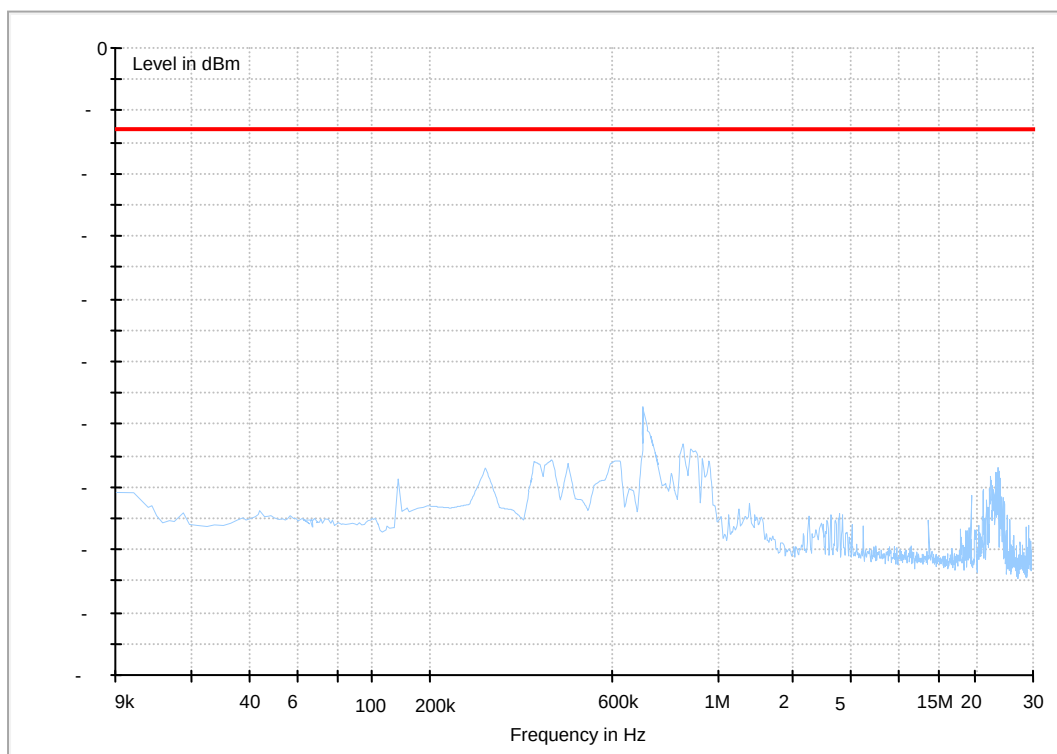


(18GHz-26.5GHz)

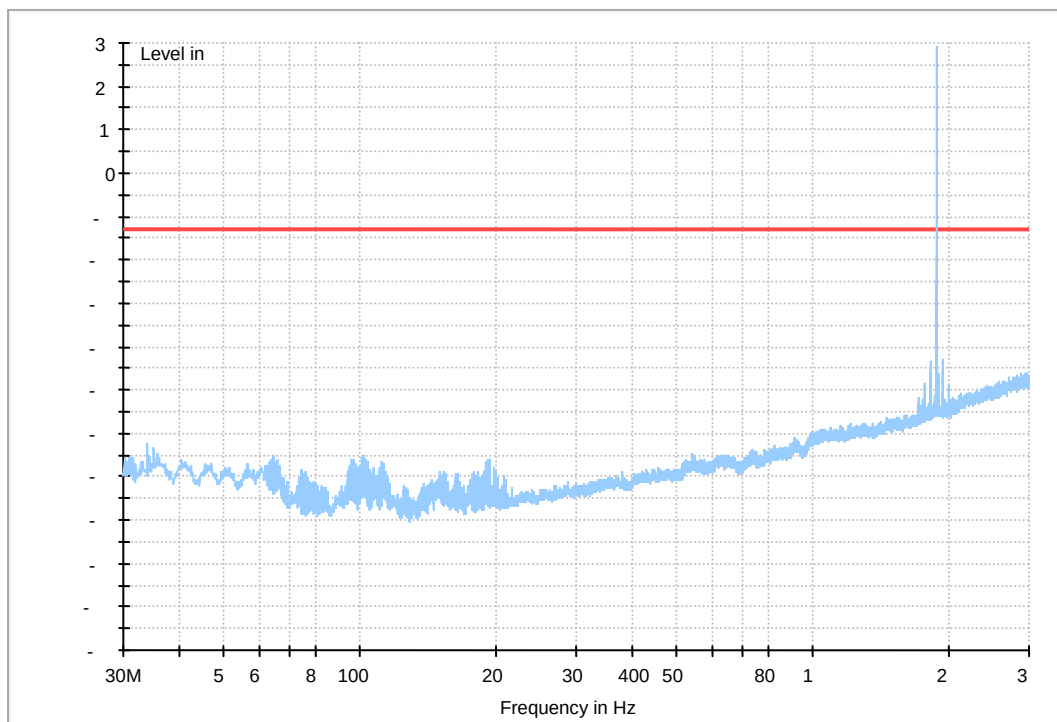


GPRS 1900

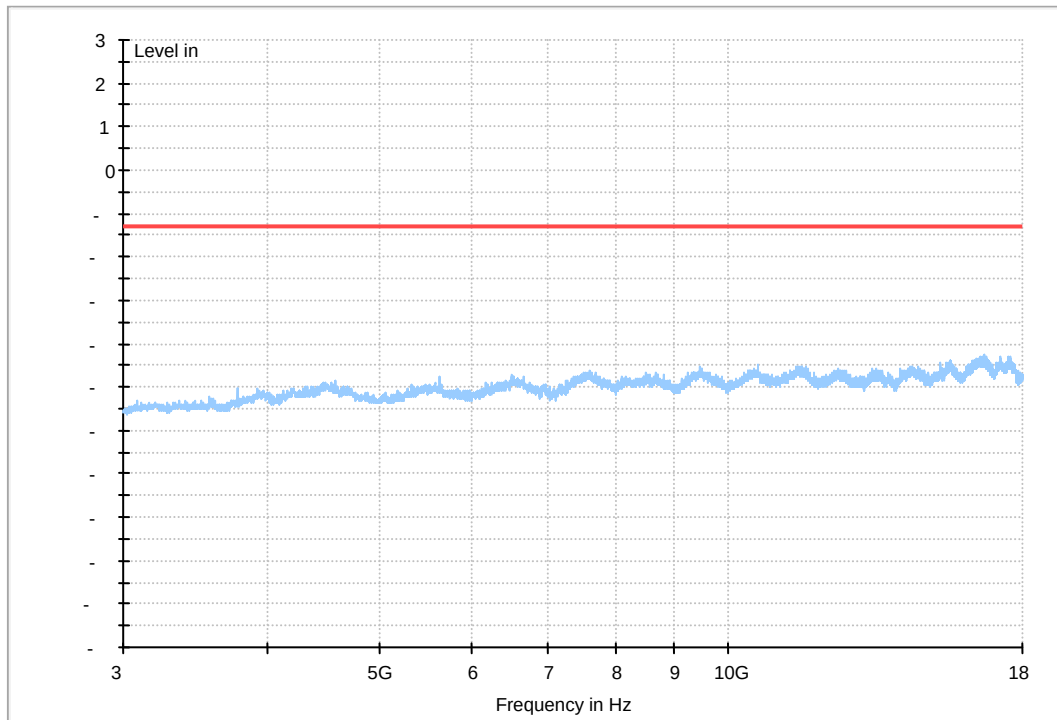
(9kHz-30MHz)



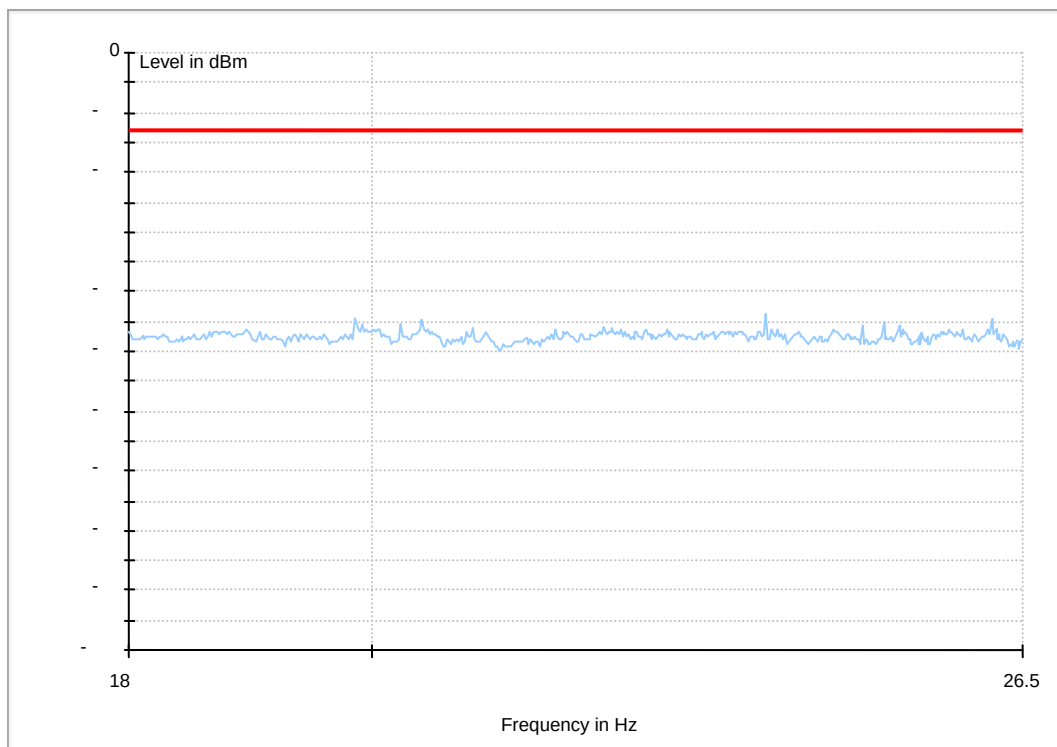
Traffic Mode (30MHz-3GHz)



Traffic Mode (3GHz-18GHz)

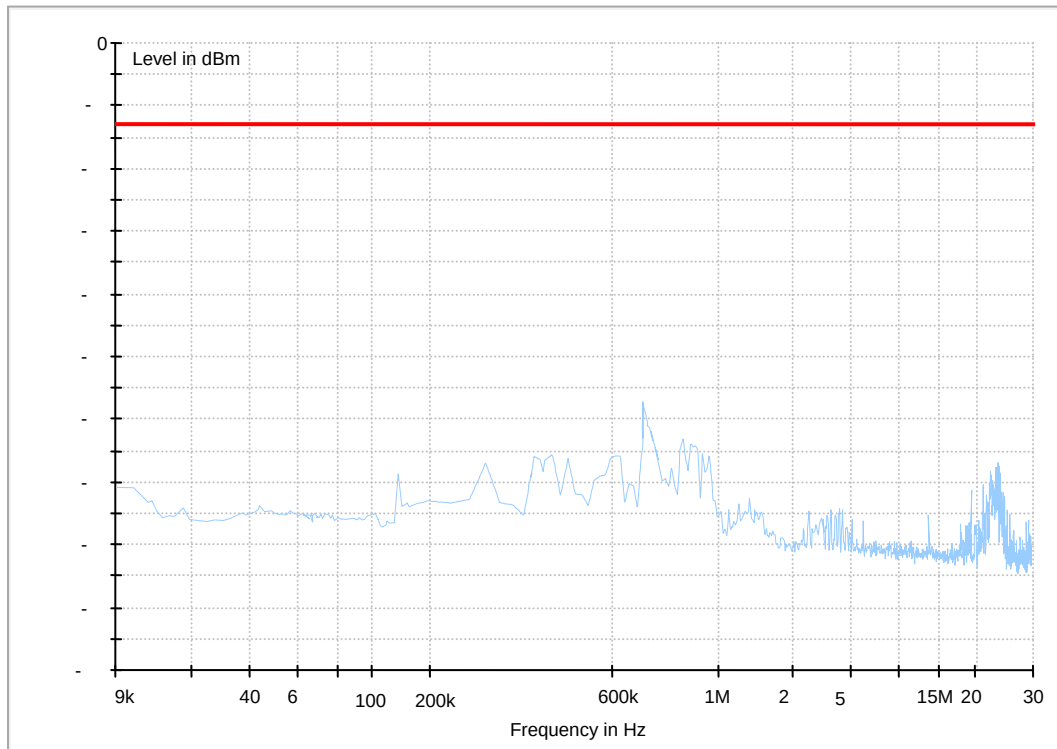


(18GHz-26.5GHz)

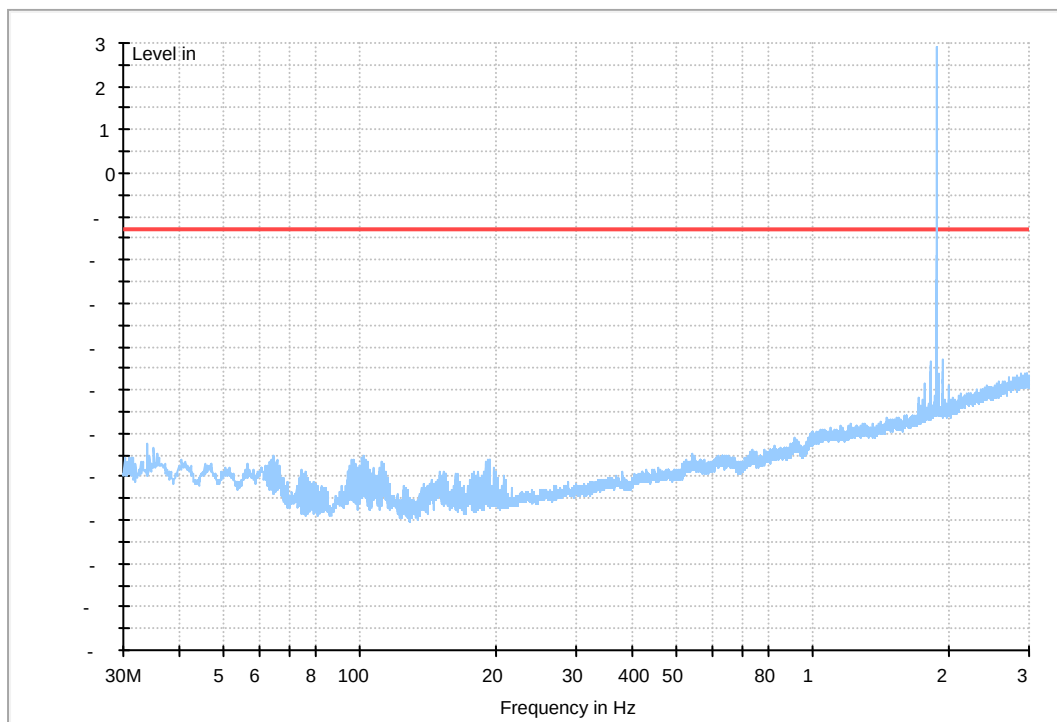


EDGE 1900

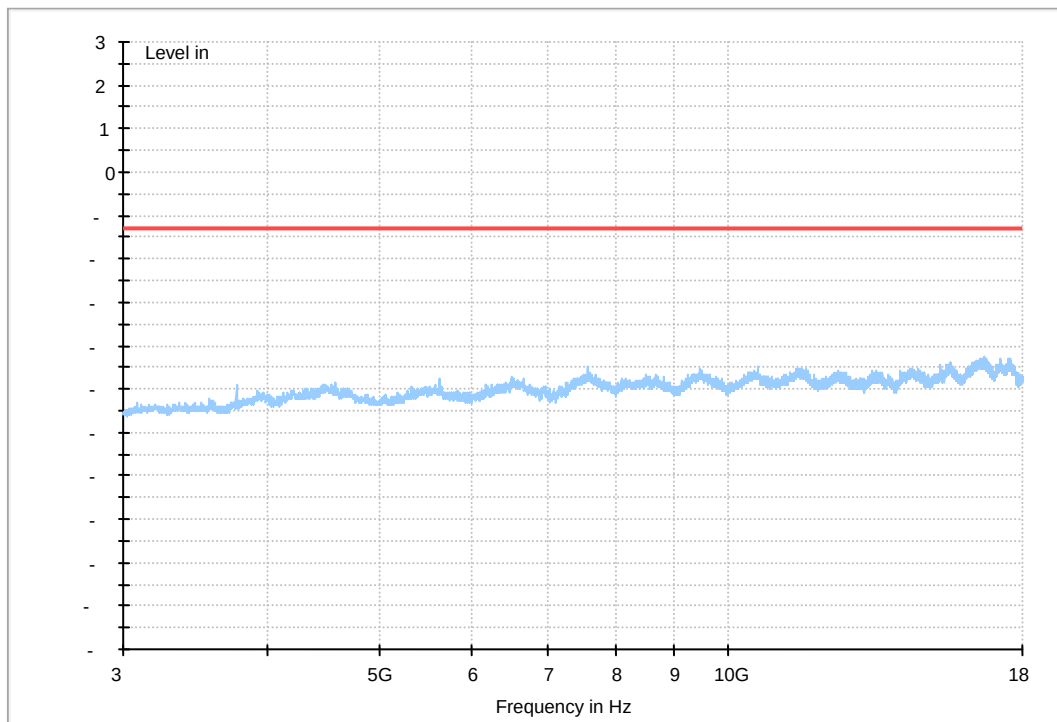
(9kHz-30MHz)



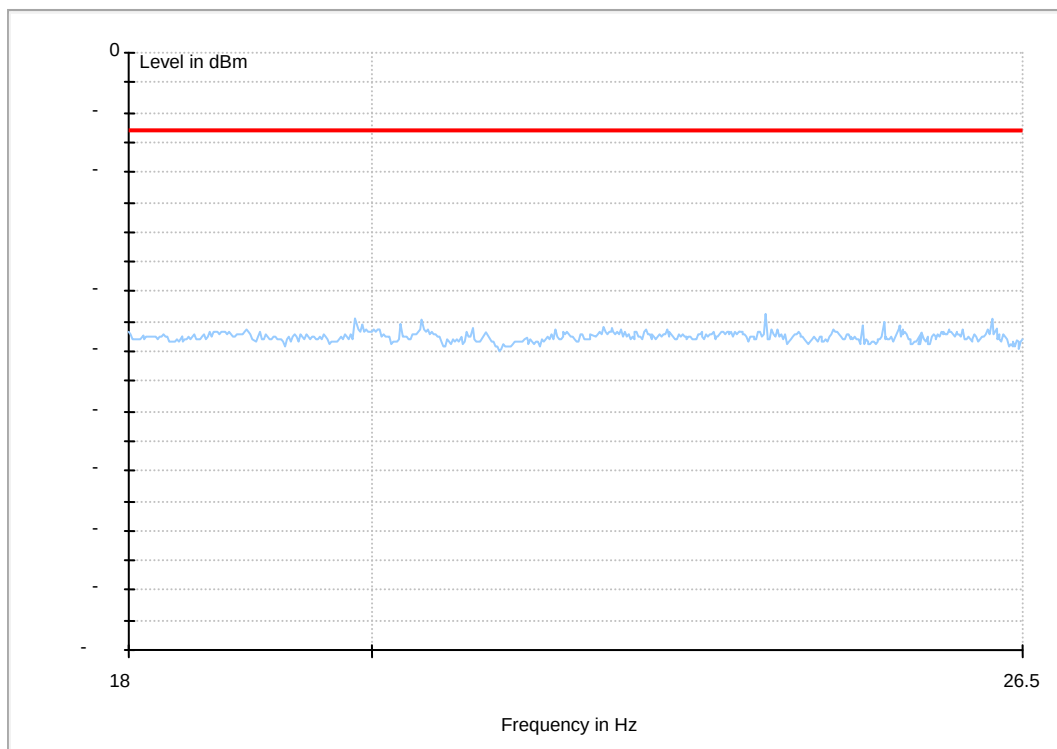
Traffic Mode (30MHz-3GHz)



Traffic Mode (3GHz-18GHz)



(18GHz-26.5GHz)



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Appendix G

Frequency Stability

According to FCC Part 2.1055& Part 24.235



Frequency Error vs. Temperature:

Test Mode	RF Ch.	Volt.	Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Limit [ppm]	Verdict
TM 1	M	VN	-30 °C	10	0.00532	---	±2.5	Pass
			-20 °C	18	0.00957	---	±2.5	Pass
			-10 °C	-12	-0.00638	---	±2.5	Pass
			0 °C	-7	-0.00372	---	±2.5	Pass
			10 °C	-22	-0.01170	---	±2.5	Pass
			20 °C	-19	-0.01011	---	±2.5	Pass
			30 °C	-16	-0.00851	---	±2.5	Pass
			40 °C	-12	-0.00638	---	±2.5	Pass
			50 °C	16	0.00851	---	±2.5	Pass
TM 2	M	VN	-30 °C	-12	-0.00638	---	±2.5	Pass
			-20 °C	21	0.01117	---	±2.5	Pass
			-10 °C	17	0.00904	---	±2.5	Pass
			0 °C	-11	-0.00585	---	±2.5	Pass
			10 °C	18	0.00957	---	±2.5	Pass
			20 °C	-15	-0.00798	---	±2.5	Pass
			30 °C	-23	-0.01223	---	±2.5	Pass
			40 °C	-7	-0.00372	---	±2.5	Pass
			50 °C	-17	-0.00904	---	±2.5	Pass



Frequency Error vs. Voltage:

Test Mode	RF Ch.	Temp.	Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Limit [ppm]	Verdict
TM 1	M	TN	VL	-18	-0.00957	---	±2.5	Pass
			VN	-9	-0.00479	---	±2.5	Pass
			VH	13	0.00691	---	±2.5	Pass
TM 2	M	TN	VL	-6	-0.00319	---	±2.5	Pass
			VN	14	0.00745	---	±2.5	Pass
			VH	-21	-0.01117	---	±2.5	Pass

-----The END-----